AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-590-3758
http://www.aeseinc.com

MEMORANDUM

TO: Lynda Deschambault, EPA RPM

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: November 1, 2016

SUBJECT: Rapid review of ***"Draft: Mine Waste Technical Data Summary Report*** **Leviathan Mine Site Alpine County, California, April 23, 2016"** (160423 Mine Waste TDSR.pdf)

CC: Chairman Mortimer, WTN&C
Diane Vitols, General Counsel, WTN&C
Dr. Harper
File

The Washoe Tribe has performed a rapid review of the aforementioned document. General Comments are followed by Specific comments.

General Comments

1. The Tribe concurs with BP's overall recommendation:

> *Based on the evaluation of the mine waste investigation results described in this report, no additional characterization activities are recommended to satisfy the requirements of the RI. (Page 89)*

The Tribe generally agrees with the conclusions that the wastes are essentially homogeneously heterogeneous and will need to be addressed via remedial action (this was our conclusion circa 2000 when we first visited the site).[1] [2] Regardless, except for understanding the concentrations of COC in soils associated with the "halo", our comments do not support more sampling on-site

In fact this consistent with our recommendation provided in our October 23, 2014 review entitled:

> Rapid review of ***"On-Property Focused Remedial Investigation Work Plan Amendment No. 6, Revision 1 – Characterization of Mine Waste Using FPXRF Screening Survey Leviathan Mine Site Alpine County, California"***[3] (Attachment 1).

As well as our general comment provided in our January 29, 2015 review entitled:

> Rapid review of ***On-Property Focused Remedial Investigation Work Plan No. 8: Detailed Stream Sediment and Floodplain Soil Investigations Leviathan Mine Site Alpine County, California October 2, 2015***. (Attachment 2)

Also, much earlier, General Comment No, 6 of our June 18, 2012 review entitled:

> Review of "**Addendum No. 1 - Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18"** . (Attachment 3)

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[1] The remedy for the Midnite Uranium Mine Superfund Site on the Spokane Reservation involved consolidating all of the 20m cubic yards of waste rock (all low NNP, like Leviathan) in existing pits and covering the filled pits to reduce exposure to infiltration, reducing risk to humans, and costs of cover material as well as costs of perpetual water treatment. The volume of waste estimated for the Leviathan (13m cubic yards) is much less.

[2] The Tribe appreciates most of the geostatistical analyses, even though the results from such work will not likely be applicable or realistically employable in the remedial design.

[3] Upon re-reviewing Attachment 1, The Tribe notes that General Comments 1 through 4 have still not been addressed.

Points to the fact that pre-release baseline (PRB) is more critical to the overall RI/FS:

> *6. As stated in previous comments on previous documents, since mixed doses from, mixed pathways, originating from multiple media are present at the site, and since the reasonably foreseeable future land use (RFFLU) for the area includes subsistence use by the Tribe, a remedy that results in pre-release baseline will likely be the only alternative that is protective of the Washoe, under CERCLA. Therefore, comparisons of media to published risk-based criteria will result in false negatives and will not result in an alternative that is protective of the Tribe. See also General Comment No. 5.*

This fact is why determining PRB is the first major step in characterizing the solid and liquid phases (i.e. abiotic media) associated with a mine site.

Once again, all of these "Focused" or "Accelerated" characterization studies were initially designed to streamline the RI/FS process and move toward selection of the remedy in a manner which was believed to be faster and more efficient than the traditional approach outlined in the NCP. However, today we are faced with still not knowing PRB for the solid or liquid phases associated with the site.

Finally, General Comment No. 2 of our July 1, 2016 comments entitled:

> Rapid Review of ***Surface Water Technical Data Summary Report and Response to U.S. EPA and LRWQCB Comments on the Report titled Evaluation of Historical and RI/FS Surface Water Data Leviathan Mine Site Alpine County, California*** (Attachment 4).

Points-out:

2. Once again, the Tribe is the most sensitive receptor for the site. The data usability analysis and risk-based screening levels, described below, are based on the general public-a population that does not, and likely will never, live the area. Therefore, decisions based on these criteria are meaningless and yet another waste of time. [4]

> *Since the June 30, 2015 submittal, Atlantic Richfield and U.S. EPA have discussed the content and format of interim RI data submittals including the requested expansion of the data quality review and data usability sections and the inclusion of a discussion of risk-based screening levels.*

[4] "Four years and little change. The results likely will still not meet basic requirements of "Guidance for Data Usability in Risk Assessment" (EPA, 1992). This four year period is yet another lesson in the "time value of money"—An expense shouldered by the Tribe." (excerpted from May 21, 2015 Review of "Draft Final Reference Area Focused Remedial Investigation Work Plan Leviathan Mine Site Alpine County, California", February 28, 2015)

> Finally, due to Tribal uses of the area and the fact that a pre-release conditions (specifically arsenic estimated by offsite reference areas) exceed RBCs protective of the Tribe, preliminary remediation goals (PRG), will indeed be pre-release baseline (background). In other words, like most mine sites in which tribes are impacted, the NCP-based risk allocation has already been usurped by background, forcing EPA to adopt background as the PRG. In summary, cleaning-up to premining conditions.

In summary, the administrative record contains numerous sets of comments submitted by the Tribe[5] indicating that determination of PRB of solid and liquid phases is the most import requirement, since PRB of only one of these media likely usurps the allocatable risk to the Tribe and others under the NCP. Once again, this means that cleanup for this site will be based on PRB—not human or ecological risk. Therefore, much valuable time has been wasted on projects that really are not germane to cleanup.

2. BP has effectively screened-out the TAL metals based on their choice of a substandard technology.

> Based on the comparison of laboratory and FPXRF results, arsenic, copper, lead, manganese, nickel, selenium, and zinc were retained as seven indicator metals to be used in data interpretation. (Page 36; last paragraph; last sentence)

From this it appears that FPXRF only was only able to be used to provide reliable estimates for these 7 metals. Meaning FPXRF did not meet DQOs for the remaining TAL metals. The BHHRA, BERA, and post remedy estimates of risk via forward predictions of risk via the HHRA and ERA will involve all of the TAL metals. There is no information to suggest that the 7 FPXRF metals are covariates with the remaining TAL metals. Please provide details on how the other 7 TAL metals will be accurately estimated for the halo area.

In summary, BP has effectively screened-out the TAL metals based on their choice of substandard technology. As discussed elsewhere herein, screening-out of COCs for the Mined Area (MA) cannot occur:

(1) until the BHHRA- or the BERA-defined thresholds have been determined,

(2) until PRB for the MA has been determined, or

[5] The attachments provided herein are only a handful of comments on these issues provided as examples. The administrative record contains all of the Tribe's comments on these issues.

(3) unless BP can prove that the proposed remedy will break the important exposure pathways (predominantly the wastepile, to groundwater, to surface water pathway).

However, even though no reliable results from work in these three areas have been produced to date, it is clear that BP was able to prove the obvious with just these 7 COCs using geostatistics and more canonical approaches —the COCs contained and released from the waste piles are so intermixed that they can be conceptualized as being homogeneously heterogeneous and since they are the predominant source of contamination, they will need to be physically addressed via the remedy.

The Tribe generally agrees with this overarching obvious conclusion for the MA; however, due to the much lower signal-to-noise ratio anticipated in the halo area as well as downstream from the site, and the HHRA requirement for targeting a particular particle size, FPXRF results will not be a useful technique to support sound future - decision making.

3. **BP still cannot screen out any COC/PCOC/COPEC, etc. at this time.** Residential HHSLs are determine for a single COC, single pathway, originating from a single medium. In this case, soil to the exclusion of risk from ingestion of SW, GW, and ingestion of anything that may include up-chain transfer of COCs from the abiotic media. Risk from SW or GW alone, regardless of the remedy, usurps the risk allocation under the NCP; therefore, if these pathways are not addressed and will not meet PRB, soil must be at PRB. Again, PRB and not risk will be the cleanup driver for the Mined Area; However, risk will be much more important downgradient of the MA in the MAA (see General Comment No. 1)

   Even though risk is not the driver for the MA, statements made and actions presented in this document are incorrect. We have attempted to identify some of these in order to signal BP that these concerns will be raised in the future for geographic areas where risk is involved remedy selection. For example the following statement is incorrect on numerous levels when considering that the RSLs or DTSC do not pertain to cases like this one where multiple COCs originating from multiple media, following pathways, is occurring.

   > To account for potential cumulative effects of multiple metals, RSLs or DTSC-modified screening levels for noncarcinogens were based on a noncancer hazard quotient of 0.1 (Table 8-2). No adjustment is required for carcinogens because potential cumulative effects of carcinogens are accounted for when RSLs are set at the lower end of U.S. EPA's acceptable risk range ($1x10^{-6}$ to $1x10^{-4}$).

4. **The Tribe recommend reserving vegetation sampling and solubility testing (an ARAR) for another document.** The majority of the focus of this document pertains to characterizing the distribution of COCs in solid materials. Vegetation is an FS issue and should be reserved for that portion of the project. For example:

> Based on previous work performed at the site it appears that the success of revegetation will be substantially dependent on the ability to amend the mine waste with organic matter and nutrients, as well as lime for neutralization of acid-generating waste.

The success of revegetation will also hinge on the ability to do this with out polluting surface water with amendments, including nutrients, or reducing the flow of the creek. Meeting both of these criteria is very challenging and coupled with the fact that clean cover material and soils are expensive, and require a large amount of hauling over dangerous roads, these conditions will likely lead to a remedy similar to that employed at the Midnite Uranium Mine Superfund Site—one that reduces the footprint of the site by reconsolidating waste rock in the open pit while minimally relying of revegetation (see footnote 1 to General Comment No. 1)

5. **DQOs have been incorrectly developed and incorrectly employed throughout this RI/FS process.**[6] Although the DQOs are the most technically import section of any workplan and subsequent analyses because they dictate the "rules to the game", the Tribe does not plan on reviewing the DQOs section (again and again….). This means that even the limited data quality analysis (DQA) provided in this document is not reliable and cannot be used to influence remedial decisions for areas located off of the MA.

6. The document includes a large amount of technical calculations that cannot be easily evaluated or reproduced without the supporting spreadsheets. Please provide the supporting spreadsheets and digitally stored data so they we can prepare for future results.

[6] Even after several drafts of the workplans where the Tribe has commented extensively on shortfalls of the basic DQOs (Appendix 4), BP is still unable to form the correct null hypothesis statements, and EPA continues to wander through the darkness.

Specific Comments

1. Page ES-2 Principal Study Questions 1 and 2.

> **Principal Study Question No. 1:** Do COPCs/COPECs in mine waste represent an unacceptable risk to human health or ecological receptors, and do complete exposure pathways need to be evaluated through further study?
>
> **Principal Study Question No. 2:** Are the mine waste soils physical and chemical characteristics suitable for establishing and maintaining vegetation? If not, how can the mine waste soil be modified to improve its ability to support vegetation?

In light of discussion provided in General Comment 1, Question 1 is not germane to the RI/FS. Question No. 2 is only germane to the FS if revegetation of existing surfaces is considered as a likely remedial action alternative. The likelihood of this alternative moving forward in the FS has not been determined at this point.

2. Page ES-2; 3. DATA EVALUATION FOR RISK ASSESSMENT

> A risk assessment data set for mine waste was compiled for comparison to human health and ecological risk-based screening levels and proxy reference concentrations to assess potential impacts associated with exposures to mine waste at the Leviathan Mine Site. Exposure scenarios, receptors, and data evaluation units (exposure areas) were identified for the purpose of developing exposure point concentrations for use in the human health and ecological risk assessments.

Screens are suppose to be designed to provide conservative estimates. The Screening criteria described here are not conservative and are not do not provide nearly the requisite protection for members of the Tribe or the General Public. See General Comment No.3.

3. Page ES-4, First full paragraph, last sentence:

> Data usability assessments indicated that mine waste investigation data meet the requirements of the DQOs developed during planning of mine waste investigations.

Clearly the data do not meet the data usability requirements following EPA 1992 approach; however, as described in General Comment No. 1, PRB will be the basis of the remedial action objective (or preliminary remediation goal)— risk will not be the cleanup driver.[7] However, if COCs sampled in purported "reference areas" are biased-high, and approach those concentrations observed for the Site, statistical discrimination between Site materials and PRB could require fairly extensive sampling.

4. Page ES-4, First full paragraph, last bullet:

> ● Based on visual examination of spatial distribution maps, the distribution of RI/FS metals across the mine waste is highly variable resulting in considerable heterogeneity in RI/FS metals concentrations are not consistent among all the metals and change significantly within hundreds of feet. As a result, spatial trends in RI/FS metals concentrations are not apparent and were evaluated using geostatistical techniques to assess possible spatial relationships. The heterogeneity in RI/FS metal concentrations within mine water materials is consistent with the random distribution of mine waste associated with the reported lack of coordinated plan for the placement of overburden and waste rock during mining activities.

Throughout the document, BP essentially conclude that the subset of TAL metals measured in waste piles are so inter-mixed that they can be considered nearly homogeneously-heterogeneous over the scale of the Mined Area (MA), which is consistent with our interpretations provided in General Comment 1.

However, BP also concludes that a subgroup of COCs is associated with longer, more regional range (second bullet, below).

> ● Evaluation of spatial associations between various metals in mine waste samples suggests the presence of two groupings of metals. The first group includes aluminum beryllium, cobalt, manganese, nickel, and zinc. This group of metals tends to be associated with local scales of spatial variation – or short-range spatial variations in metal distributions. The second group consists of antimony, arsenic, barium, lead, mercury, lead, selenium, and, silver. This group of metals tends to associate with regional scales of spatial variation – or long-range spatial variations in metal distributions.

The Tribe is concerned that BP will attempt to ascribe the apparent spatial co-variance observed for this group to regional background. This conclusion is hard to believe

[7] The document fails to demonstrate with quantitative measurements that DQOs have been met. Part of the problem stems from the fact that quantitative DQOs are not available. The Tribe has presented extensive comments in the past on the workplans for this work and the level of detail required of BP on DQOs for this project. If risk-based decisions were required for the MA, these data would not meet EPA's data usability requirements and resampling and analysis would be necessary.

especially since the degree of mechanical mixing that has occurred via mining and wasterock/overburden placement.

5. Page ES-6, bullet 2:

> ● Concentrations of metals were different in the fine soil fraction (less than 0.25 millimeter [mm]) compared to the concentrations in bulk samples, which includes both the fine and coarse fractions. Because human receptors are more likely to be exposed to the fine fraction of soil particles which are more likely to adhere to the skin or be resuspended in air, the 95% upper confidence limits (UCLs) to be used for human health risk calculations were adjusted to represent fine fraction concentrations based on chemical-specific regressions.

The Tribe generally agrees with this approach; however, 250um is likely too large. For human ingestion, the less than 62 um is the sand/silt cutoff on the Wentworth grain size classification scale. This size fraction is more easily consumed unknowingly by the receptor. The 250um is sand sized and even children are like to reject food containing soil of this size fraction.

6. Page ES-6, bullet 3:

> ● Proxy reference concentrations were used for comparison to concentrations in mine waste using a simple comparison of maximum concentrations; site-specific reference concentrations will be developed in 2016. Maximum concentrations of the following RI/FS metals in the 0- to 2-foot interval were below proxy reference concentrations: aluminum, beryllium, cadmium, chromium, hexavalent chromium, cobalt, nickel, silver, vanadium, and zinc. This conclusion will be re-evaluated once a final reference data set is developed for mine waste and will be considered in the final evaluation of COPCs/COPECs for the BHHRA. Consistency with reference concentrations may suggest that the RI/FS metal is not site-related.

These proxy PRB values for the FPXRF-list limited COPCs/COPECs have not been agreed upon. The UTL95 of a subpopulation is the metric employed by EPA to characterize PRB using a reference area approach. However, both the subpopulations (i.e. samples) are conditioned by adherence to homoscedasticity, stationarity, and must be similar distribution-types[8]. Even under these conditions, the UTL95 is driven by the higher concentrations of the target COC in specimens sampled from the reference

[8] The use of the UTL95 in EPA's approach to discriminate between the two populations is best suited for an instance in which both distributions are normal or at least normal once they have been transformed using the same transform. Since, by definition, ore bodies are anomalies in the geologic materials, and since anomalies are, by definition, out of the ordinary short-range tends in the geologic materials, it is generally not possible to meet the aforementioned conditions. Also from a practical standpoint, had an appropriate reference area for PRB been identified, it would have been mined as well.

subpopulation. If the aforementioned conditions are not met, the UTL95 is essentially biased high and does not represent PRB at the scale of interest.

The Tribe has long held concerns that determination of PRB is the key to the RI/FS process (See General Comment No. 1) and is deeply concerned that BP will be prospecting for high values of COCs during characterization of reference areas. Again the administrative record is contains large discussion of the Tribe's concerns on this issue.

7. Page ES-6, bullet 4:

- Maximum concentrations of 16 RI/FS metals in soil 0 to 2 feet bgs exceed human health screening levels (HHSLs) for residential site use. The maximum concentration of chromium, nickel, silver, and zinc were below the human health screening levels for residential site use.

BP cannot screen out any COC at this time. Residential HHSLs are determine for a single COC, single pathway, originating from a single medium. In this case soil to the exclusion of risk from ingestion of SW or GW. Risk from SW or GW alone, regardless of the remedy, usurps the risk allocation under the NCP therefore, if these pathways are not addressed, Soil must be at PRB. See General Comment No. 2

8. Page ES-6, bullet 5:

- The number of sample locations exceeding soil screening levels (SSLs) for ecological receptors varies substantially among receptor categories (plants, soil invertebrates, birds, and mammals) and specific metals. RI/FS metals that had a high percentage of exceedances for all receptor categories include arsenic, chromium, and selenium. RI/FS metals that did not exceed any SSLs include aluminum, beryllium, hexavalent chromium, and silver.

Like HSSLs, SSLs are determine for a single COC, single pathway, originating from a single medium. See previous comment and General Comment No. 2.

9. Page ES-6, bullet 6:

- Potential human exposure to mine waste is anticipated to occur over a large area which is not limited by fences, property boundaries, or structures. Metals concentrations vary by metal throughout the mine waste area with some metals higher in one area and other metals higher in another area. A human receptor could not be exposed to the higher concentrations of one metal in one area and higher concentrations of another metal in another area simultaneously. Rather they are considered to move throughout the mine waste area so over time they are exposed to average conditions throughout. As a result, the mine waste

area is considered a single exposure area for residential receptors and exposure point concentrations (EPCs) were developed for the entire mine waste pile.

Perhaps, but like ecological receptors, Tribal citizens will spend more time in specific area than another depending on whether they are hunting, fishing, gathering, or just residing. See General Comment 3.

Again, this approach should not change the outcome that all of the waste piles will need to be removed or stabilized in place. Again Risk will not be a big decision driver in remediating the Site (See General Comment No. 1)

10. Page ES-7, bullet 1:

- An important element of the completion of risk assessments and the evaluation of remedial alternatives in the FS at Leviathan Mine is the development of reference concentrations for mine waste. As a result, it is recommended that reference sampling of mineralized geologic materials and terrestrial soils be completed as described in the Draft Final Reference Area Focused Remedial Investigation Work Plan to support comparisons of areas potentially affected by mine waste, human health and ecological risk assessments, and the evaluation of potential remedial alternatives.

See General comment No. 1 regarding PRB determination in the RI/FS process. BP has not demonstrated that the Site contained mineralized geologic materials prior to mining. The Tribe has comments extensively on this issues over the last 15 years and is still waiting on BP to provide evidence that the orebody was not a blind deposit:

> *The main sulfur orebody was located beneath approximately 300 feet of overburden. The orebody was accessed by removing approximately 22 million tons of overburden, creating an open pit with an area of about 50 acres.*

Also major releases are a consequence of open pit construction beginning in 1952.

11. Entire Section 2.0 Geology

BP spends a lot of time on the regional geology, but just skims over the site-specific geology. Site-scale geology should be the focus for the site characterization report.

12. Entire section: 4.1 CONCEPTUAL SITE MODEL FOR MINE WASTE

PCSM stands for "preliminary" not “programmatic”. This entire section is a verbal walk-through of the PCSM without providing the PCSM in diagram format. Recommend including the PCSM wireframe depicting all pathways.

13. Page 17; First full paragraph; first sentence:

> Current acid-drainage management at Leviathan Mine Site includes year round containment and campaign treatment of AD from the Adit and PUD…

This sentence is misleading in that only the actively captured ARD is contained.

14. Page 17; Last full paragraph; first sentence:

> Historically, the oxidation of sulfur and sulfide minerals caused the degradation of water quality in Aspen and Leviathan creeks.

This statement applies to post mining conditions. BP needs to provide evidence that ARD was issuing to Leviathan and Bryant Creeks prior to mining (i.e. need to reconstruct PRB of surface water and sediments).

15. Page 17; remainder of Last full paragraph:

> The 1985 pollution abatement project reduced chemical mass loading to Leviathan and Bryant creeks downstream from the mine site. Early response actions implemented beginning in 1998 to 2000 (stopping pond overflow) resulted in significant improvements in surface water quality (lower metals concentrations) in Leviathan, Aspen, and Bryant creeks. Even greater water quality improvements were evident after 2001. From 2008 to the present, variability in chemical concentrations in surface water downstream of AD discharges at the site is considerably lower than before 2008, and concentrations of several metals are lower because of more reliable AD discharge capture and extended seasonal treatment. The effects of seasonal capture and treatment of the CUD and Delta Seep are reflected by decreases in metals concentrations in Leviathan Creek in the spring and summer compared with fall and winter when Atlantic Richfield is not capturing and treating these discharges. Treatment systems significantly reduce concentrations of certain metals (e.g., arsenic, iron, cobalt, nickel) in Leviathan Creek during treatment. These seasonal fluctuations are less evident in Bryant Creek, particularly lower Bryant Creek, where water quality is generally consistent with reference conditions and more consistent throughout the year.

Please provide citations corroborating all of the assertions and please include the positive effect that the beaver dams have on surface water and sediments downstream from the mined area.

16. Page 19; Section *4.1.2.3 Stream Sediment*

> Stream sediment in Leviathan Creek downstream from Leviathan Mine potentially contains mine waste eroded from the site and chemical precipitates resulting from mixing of AD with circumneutral to slightly alkaline surface water.

Need to mention that the Water treatment plants, including the aspen seep bioreactor are periodically exporting excess alkalinity, causing metals to precipitate in channel.

17. Page 21. Section 4.2 UNCERTAINTIES

The greatest uncertainties are associated with sampling is inappropriate selection of reference areas and sample design—not measurement uncertainty as described in this section.

18. Page 22: Entire section 4.3 DATA QUALITY OBJECTIVES

DQOs have been incorrectly developed and incorrectly employed throughout this RI/FS process.[9] Although the DQOs are the most technically import section of any workplan and subsequent analyses because they dictate the "rules to the game", the Tribe does not plan on reviewing the DQOs section (again and again….).

19. Page 23:

> **Problem Statement:**
>
> The extent and magnitude of COPCs/COPECs in mine waste in the On-Property Study Area are not sufficiently understood to make comparisons to reference concentrations and ARARs, to evaluate risk to human or ecological receptors, and to evaluate the need for future remedial action.

This document fall far short of solving the problem since reference areas have not been characterized. See General Comment No. 1.

20. Page 31; Section *INFORMATION GATHERING AND INTERPRETATION*

> Atlantic Richfield's mine waste investigation data collection program consisted of extent and texture mapping, discrete soil sampling from boreholes, and discrete and composite sampling from shallow hand dug locations.

[9] Even after several drafts of the workplans where the Tribe has commented extensively on shortfalls of the basic DQOs (Appendix 4), BP is still unable to form the correct null hypothesis statements, and EPA continues to wander through the darkness.

The discrete and composite samples likely have different scales of geostatistical support and should not necessarily be treated as similar specimens unless it can be shown that support is similar. Please provide this analysis.

21. Page 31; Section 5.1.1 Methods; first sentence

> Extent mapping was conducted by walking select areas of the mine waste and making notations of the extent of mine waste on field maps.

The "extent" described above appears to be the visual extent of contamination. The buffer or halo surrounding the edge of these piles where COCs have been released and transported away from the visual extent is likely much larger and will need to be considered during the FS.

22. Page 35.

> *Site-Specific Calibration Standard Locations*
>
> During the preliminary investigation, ten SSCS samples were collected. SSCS samples are discrete grab samples that were analyzed by both the laboratory and the FPXRF analyzer. The SSCS samples were used to calibrate the FPXRF analyzer and provide a means to address potential site-specific matrix interference and chemical interference.

Please provide the results of this analysis. As pointed-out in the Tribe's comments on FPXRF, BP really only need to know how well the relationship (calibration) holds near the PRG/RAO. However, BP really cannot evaluate the performance of the XRF as a surrogate tool until they are sure the calibration curve encompasses the PRG (PMB). Again this value is still not known (See General Comment No 1).

The Tribe has described the utility of the FXPRF in General comment No. 2. EPA really cannot evaluate the performance of the XRF as a surrogate tool until they are certain that the calibration curve encompasses the PRG (PMB)—again this value is not known but will differ substantially as on moves downgradient away from the MA.

23. Page 35. heading Phase 1 Sample Locations, Paragraph 2; Sentence 1:

> The sample spacing and number of samples for the Phase I sampling program was guided by professional judgement and a baseline understanding of the spatial heterogeneity at the site.

Please provide a citation for the understanding of baseline understanding of the spatial heterogeneity at the site

24. Page 36; last paragraph; last sentence

> Based on the comparison of laboratory and FPXRF results, arsenic, copper, lead, manganese, nickel, selenium, and zinc were retained as seven indicator metals to be used in data interpretation.

See General Comment No. 2

25. Page 38 first full paragraph; last sentence:

> By dividing the shortest range of spatial correlation observed between the shallow seven indicator metals (i.e. arsenic) by half, a 400-feet sample spacing interval was established for the Phase 2 sampling effort.

And entire section 5.2.3 Phase 2 Sampling and Analysis:

The Tribe recommended in comments on the Workplan for Phase II that this change in spacing based on only the 7 COCs would be problematic. However, it is clear, for reasons described in General Comment 1 and 2, that a characterization is not necessary. [10]

26. Page 40-41 entire section 5.2.3.2 Sample Analysis

The Tribe realizes has always been a proponent of sieving solid samples prior to analyses for the following reasons:

> 1. the thermodynamic effective concentration (TEC) of COCs are in part a function of the exposed surface area of the solid of study. The surface area available for chemical reaction is a function of the grain-size. Therefore, chemically analyzing samples that have been sieved better approximate the concentrations that are available to do chemical work.
>
> 2. The 250 um is still too large. 62 um is preferred (See Specific comment 5), and
>
> 3. 250um will be required to run the IEUBK mode for risk from Pb.

[10] Full characterization would include, but not be limited to understanding the range of all COCs as well as the employing the standard approach describe by EPA 1992 to discriminate between affected and unaffected subpopulations with a specified statistical power.

From the statement:

> The fine fraction was analyzed for RI/FS metals. Depending on the sample material, for some samples there was insufficient sample volume to run both bulk and the fine-fraction analyses.

It is clear that field samplers were targeting coarser materials (since not enough fines to do fines and coarser). This approach will not be helpful in the future when sampling occurs in the halo area as well as downstream from the MA.

27. Page 42 section 5.3.2 Documentation; last bullet:

> Mercury and hexavalent chromium were not analyzed in 23 additional bulk mine waste samples because insufficient soil was available for both bulk and fine fraction (grain size less than 0.25 mm) was required for analyses. Almost 300 mine waste samples were available for hexavalent chromium and considered adequate to characterize mine waste. [Emphasis added]

Please provide the Test Adequacy analysis. Note the quantitative criteria is not listed in the DQO section.

28. Page 42 entire section 5.3.4 Analytical Methods and Detection Limits

It is clear that BP does not understand the difference between method detection limits (MDL) and reporting limits (RL; or practical quantitation limits, PQL).

As the Tribe has pointed out in comments on the Phase I and Phase II workplans, the RL exceeds the screening level. This problem will arise again on the HHRA employing the Tribal risk scenario for the off the MA since HHRA-based screening levels have not been defined. Again since the PRG/RAO based on the Tribal Scenario will likely be MDL for this area (not PRB for the MA which will be much higher), high-quality analyses will be required. See General Comments No. 1 and 2.

29. Page 46; First full paragraph; last sentence

> In general, results of the statistical power analysis indicate that the Phase 2 Mine Waste sampling program collected sufficient number of samples to service statistical hypothesis tests relevant to the DQOs for mine waste investigation (Appendix 4-A) The results of the statistical power assessment are detailed in Section 6.2.1.4.

It is not clear why BP is generalizing/summarizing findings in section 5.0 and pushing off technical analysis until later in the doc. Also this summary is not true and is not supported by statements made in Section 8

30. Page 47 and 48; last paragraph; last sentence:

> It is important to clarify that these threshold values are considered hypothetical because they infer no validated meaning and are not a substitute for yet to be developed site-specific reference concentrations.

Equally important is the likelihood of exceeding HHRA threshold or ARAR. Note this is one reason we recommended that characterization of the Reference areas should have occurred prior to characterization of the MA. See General Comment No. 1.

31. Page 48; 5.4.5 Multivariate Principal Component Analysis; first paragraph; second sentence.

> In theory, metals and other measured physical properties that are grouped together are interpreted to originate from the same physical source or undergo similar in situ physical and chemical processes.

This may be true for a natural deposit; however, the concentration of COCs observed today are a consequence the following and may have little physico-chemical meaning:

1. Initial natural variability of the deposit, wasterock, overburden, and natural soils/bedrock

2. time-dependent man-made variability introduced by excavation and placement history

3. time-dependent variability introduced by leaching and transport, and

4. variability introduced by sampling design (grid size, support, REV, etc).

Regardless, the PCA was not instrumental to the conclusions.

32. Page 49; Last paragraph; last sentence:

> An IID distribution means that the sample variance embodies a completely random distribution that is void of spatial correlations in metals concentrations from one sample location to the next. Preliminary variogram analysis indicates

there are measurable spatial correlations for most metals. Because the power assessment does not account for spatial correlation between sampling locations it can overestimate the predicted number of samples.

The Tribe agrees in that their should not be trends in the data, whereas variograms show otherwise or at that random variables are least spatially correlated.

The Tribe's experience is that strict IID is rarely met in surficial geologic materials associated with an ore deposit that daylights at the surface. However, strict IID is observed if the deposit was blind since the events are independent.

Regardless, strict IID should be observed between the affected and the ref sample (sub populations), but not necessarily between specimens comprising the sample. In other words, strictly speaking, both the reference area and affected are should be relatively homogeneous and isotropic for power analyses to be used correctly. However, the consequences of small divergence associated with this assumption should minimal.

A work around for case where trend is observed is to segregate the domain into neighborhoods. The downside is that each neighborhood has to be sampled at much greater frequencies than the entire domain (generally 30+ samples/neighborhood when employing the method described in EPA 1992)

33. Page 54; second full paragraph; second sentence:

Eighteen of the 20 RI/FS metals for the 0- to 0.5-foot bgs depth and 17 of the 20 metals for the 1.5- to 2.0-foot bgs depth exhibit a range value greater than 400 feet thereby indicating that the Phase 2 sampling design was overall adequate for: 1) capturing the spatial heterogeneity of metal distributions for these sampling depths and 2) collecting an adequate sample number to service the statistical hypothesis testing detailed in the DQOs for the mine waste investigation. [Emphasis added]

The conclusion regarding adequacy are incorrect—they do not meet the DQOs for all of the TAL metals.[11] This was anticipated in the Tribe's comments on the workplan for both Phases I and II. Also note the ranges are not reported by particle-size cutoff---these could result in shorter ranges. In summary, BP did not acquire enough specimens that contain the most variable COC. This is required to enable discrimination between unaffected (PRB) and affected populations. [12]

[11] Incorrect, but inconsequential
[12] PRB has not been established yet. See General comment 1

34. Page 58: Second full paragraph; last sentence:

> Results of the statistical hypotheses tests evaluating differences in metals concentrations with depth are provided in Appendix 6-D.

In all cases, cannot reject the null due to poor statistical power (low n). The Tribe forewarned EPA/BP on this concern in comments on both Phase I and Phase II characterization workplans.

35. Page 61: Third full paragraph; second sentence:

> The R^2 for the regressions for each metal are relatively high (0.69 to 0.97) indicating that the bulk metal concentration is a good predictor of the concentration of metals in the fine fraction and that the regression line quantifies this relationship well over the range of concentrations measured.

The Tribe agrees with the approach; however, again the particle size cutoff is too coarse (See Specific comment No. 2)

> Based on previous work performed at the site it appears that the success of revegetation will be substantially dependent on the ability to amend the mine waste with organic matter and nutrients, as well as lime for neutralization of acid-generating waste.

36. Page 62; Section 6.4 ASSESSMENT OF MINE WASTE EFFECTS ON REVEGETATION; first paragraph 1; last sentence

> Based on previous work performed at the site it appears that the success of revegetation will be substantially dependent on the ability to amend the mine waste with organic matter and nutrients, as well as lime for neutralization of acid-generating waste.

The success of revegetation will also hinge on the ability to do this with out polluting surface water w/amendments, including nutrients, or reducing the flow of the creek. Meeting both of these criteria is very challenging and coupled with the fact that clean cover material and soils are expensive, and require a large amount of hauling over dangerous roads, these conditions will likely lead to a remedy similar to that employed at the Midnite Uranium Mine Superfund Site—one that reduces the footprint of the site by reconsolidating wasterock in the open pit (see footnote 1 to General Comment No. 1)

37. Page 73: first partial paragraph; Last sentence:

> Following laboratory analysis of more than 230 samples for COPC/COPECs, additional variogram modeling was performed using the laboratory data to demonstrate the adequacy of the sample spacing used for the mine waste investigation as described in Section 6.2.

This statement is incorrect. Some reported results are still below the covariance range. The retrospective statistical power analysis has problem and if it were critical to conclusions, would require more sampling. Adequacy needs to defined based meeting the DQOs with alpha and beta as described in EPA 2006 as well as EPA 1992—not professional judgments and not focus group derived estimates of "adequacy".

38. Page 73: full partial paragraph; Third sentence:

> The evaluation of mine waste data sets using both qualitative and quantitative methods is described in Sections 6.1 through 6.4 above.

Quantitative analysis as described in EPA 2006 and EPA 1992.

39. Page 73: Bullet 2

> ● The mine waste data sets consist of 10 or more samples representative of a specific medium consistent with guidelines outlined in the ProUCL User Guide.

Once again, this is guidance for use of PRO UCL—not guidance for site characterization.

40. Pages 76 and 77 Entire section 8.2.1 concentrations. 8.2.1.i Risk-Based Screening Levels

See General Comments 1 and 3.

41. Page 77; Section 8.2.2 Proxy Reference Area Concentrations; First paragraph; Last Sentence:

> One objective for the collection of site-specific reference data for mine waste is that mine waste is naturally mineralized rock and an appropriate reference for this material is another naturally mineralized area. The comparison to reference data provided herein will be revised once the reference data specific to mine waste is available.

Perhaps, but this mineralized rock was buried and was predominantly a blind deposit (See Specific Comment No. 2. Page ES-7, bullet 1). Again, the site cannot be characterized until PRB has been determined. This is why this document will require re-review once the PRB has been determined. Again characterization of the reference area should have been the first step—now ARCO will be prospecting for high concentration areas. See General Comment No. 1).

42. Page 77; Section 8.4.1.1 Human Health Receptors and Exposure Pathways

See General Comments 1 and 3.

43. Page 81; Section 8.4.1.1 Human Health Receptors and Exposure Pathways; Paragraph 1; Sentence 2:

> As described in Section 6.2.1.1, the variograms indicate that the soil has low variation over short distances (auto correlated), but becomes more heterogeneous over longer distances (on the order of less than 1,000 feet for most metals).

The tables value of ranges is much shorter than the 1000 feet grid size. Some of which are shorter than 400 feet meaning that areas between the grid are still not characterized from COCs. Also some COCs do not meet the statistical power requirements described in EPA 1992.

44. Page 83. First partial paragraph; first two sentences:

> A 95% UCL was calculated separately for the 0- to 0.5-foot and 0- to 2-foot intervals as shown in Table 8-11. In all cases, the 95% UCL was less than the maximum concentration.

By definition, this relationship must be true for all instances, everywhere .

45. Page 85; 9.0 CONCLUSIONS;

The entire section suffers from reiteration of incorrect conclusions drawn throughout the text preceding this section.

References

U.S. Environmental Protection Agency (U.S. EPA), 1992, Guidance for Data Usability in Risk Assessment, April.

U.S. Environmental Protection Agency (U.S. EPA), 2006. Guidance on Systematic Planning Using the Data Quality Objective Process: QA/G-4, (EPA/240/B-06/001). Office of Environmental Information, Washington, DC. February.

Attachment 1: Rapid review of *"On-Property Focused Remedial Investigation Work Plan Amendment No. 6, Revision 1 – Characterization of Mine Waste Using FPXRF Screening Survey Leviathan Mine Site Alpine County, California"* (FK_**On_Property**_FRI_Waste_Piles_Amendment_6.doc)

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-590-3758
http://www.aeseinc.com

MEMORANDUM

TO: Lynda Deschambault, EPA RPM

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: October 23, 2014

SUBJECT: Rapid review of ***"On-Property Focused Remedial Investigation Work Plan Amendment No. 6, Revision 1 – Characterization of Mine Waste Using FPXRF Screening Survey Leviathan Mine Site Alpine County, California"***

CC: Councilman Cruz
Lynelle Hartway, General Counsel
File

The Washoe Tribe has performed a rapid review of the aforementioned document. Due to time constraints, we are only able to pull together General Comments.

General Comments

1. We have heard from the PRPs in the past their wishes to expedite the RI/FS, and rationale for employing non-traditional approaches to meeting requirements of the NCP such as "Focused Remedial Investigations", early pilot programs, etc.

Experience with other hard-rock mines in the west tells us that the uncontained mine wastes will need to be either contained via stabilization in place (cap/cover) or stabilized via removal and contained in an onsite repository[1]. Containment in an onsite repository has significant advantages:

1. the footprint of the wastes available for future releases to the GW/SW of COCs are reduced

2. the mine waste to ground water to surface water pathways is broken

3. site runoff from clean areas is promoted, reducing future potential for infiltration

4. reduction in the footprint means less mining of adjacent areas for cover material

Analysis of the XRF screening-level waste material data indicates that all of these material will either exceed either single-COC-based ecological or human health risk-based thresholds. Magnitude and frequencies of exceedences of human and ecological risk-based thresholds (e.g. preliminary remediation goals) will greatly increase when the Tribes Human Health risk Scenario is employed and hazard indices are calculated. This means that all of the waste rock will need to be addressed.

The PRPs proposed reduction in the number of DUs associated with the mined area is a correct move in this direction; however, it does not go far enough. In our opinion, enough information has been obtained to support all of the mine wastes being incorporated into a single decision unit, and one of the aforementioned remedies described above will eventually apply to this single DU.

Employing this approach would greatly streamline the RI/FS process, freeing-up resources to characterize the riverine DU, and better define the nature and extent of contamination in the halo or fringe areas caused by the waste-pile to air pathway.

[1] Analysis of the ROD and subsequent CD for the Midnite Uranium Mine, Steven County, WA, (http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/Midnite) indicates that the two sites are fairly analogous. Both hard rock mines contaminate riverine areas used by Tribes. In a nutshell, the remedy contains all of the waste material, reduces the footprint minimizing cover/cap materials and subsequent O&M, and pipes the water treatment effluent to receiving waters that can assimilate the mine-related COCs via a mixing zone.

2. The list of COCs must include molybdenum. Copper deficiency in ungulates caused by excessive concentrations of sulfate in the presence of excess molybdenum (Ball and Nordstrom, 1985) is known to tie-up copper, making it less thermodynamically effective, and less available for necessary uptake by ungulates/ruminants.

3. From an analytical standpoint, the focus on the utility of the FPXRF should be on the error rate near the preliminary remedial goal (PRG). The data indicate that the XRF is probably OK for screening of Zn, but not Cd or Pb. (The XRF detection limit for Cd exceeds the PRG; there is merely a handful of samples that exceed the PRG for Pb. These high-values likely drive the regression)

   The Tribe is more concerned with the false negative error rate (i.e. XRF says less than the PRG, but the ICP-MS says the PRG is exceeded). Also note that experience tells us that moisture typically affects the FPXRF indicating that the FPXRF yields values that are consistently lower than actual (ICP-MS; i.e. biased low).

4. A good correlation between Cd and other non-FPXRF measurable COCs and any of the FPXRF measurable metals has not been established. The Tribe is especially concerned that EPA may be overlooking instances in which both other metals screen-out (e.g. Pb and Zn are below the PRGs) and Cd is above the PRG. This cannot be guarded against using this technology.

   A similar concern is associated with the defining the sampling grid-size when the geostatistical autocorrelation range is not known for the COCs that cannot be accurately and precisely measured by the FPXRF. As described in the Tribe's October 23, 2014 "Rapid review of **RE: Mine Waste Characterization Statistical Supporting Documentation Leviathan Mine Site, Alpine County, California** comments, the correct sampling grid spacing is governed by the COC with the shortest range. At this time, we do not know which COC is associated with the shortest range. This means that a large resampling effort may be required once the actual analytical chemistry data (i.e. EPA ILM 5.x data) is validated.

5. We searched all of the recently transmitted documents and are unable to located the stated frequency of use of the quality control calibration standards (QCCSs) associated with the FPXRF. We also cannot ascertain whether the QCCSs bound the anticipated range of the FPXRF measured COCs. The QCCSs are required frequently to determine that the system is "in control". Corrective actions need to be described for situation in which the FPXRF are "out of control", including instances in which measurements are made that are beyond the bounds of calibration.

References Cited

Ball, J.W and Nordstrom, D.K., 1985, MAJOR AND TRACE-ELEMENT ANALYSES OF ACID MINE WATERS IN THE LEVIATHAN MINE DRAINAGE BASIN, CALIFORNIA/NEVADA--OCTOBER, 1981 TO OCTOBER, 1982, USGS U.S. GEOLOGICAL SURVEY, WRI 85-4169

EPA, 2007, Record of Decision for the Midnite Uranium Mine, Steven County, WA, (http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/Midnite)

Attachment 2: Rapid review of ***On-Property Focused Remedial Investigation Work Plan No. 8: Detailed Stream Sediment and Floodplain Soil Investigations Leviathan Mine Site Alpine County, California October 2, 2015***.
(FK_LEV_Comments_Onproperty_Amend_8.doc)

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-924-0184
http://www.aeseinc.com

MEMORANDUM

TO: Lynda Deschambault, EPA RPM

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: January 29, 2015

SUBJECT: Rapid review of ***On-Property Focused Remedial Investigation Work Plan No. 8: Detailed Stream Sediment and Floodplain Soil Investigations Leviathan Mine Site Alpine County, California October 2, 2015***.

CC: Lynelle K. Hartway, General Counsel
Darrel Cruz, THP Officer
File

As you know, the RI/FS has languished for nearly 15 years since the site was placed on the NPL on March 11, 2000. The Tribe realizes that EPA is attempting to put the project back on-track and is reviving and revamping older workplans in an attempt to ramp-up the schedule once again.

The Tribe supports this effort only if it renders results that lead to a more timely remedial action; however, the poor quality of work plans that are being proposed and subsequently allowed to proceed in the spirit of expediency will likely result in numerous subsequent studies. Specifically, for this Workplan (WP), the DQOs section is inconsistent with EPA QA/G-4, the UAO, and the NCP. The WP does not provide the requisite rationale, forethought, and subsequent experimental design to answer the simple questions posed on Page 3. [1,2,3] Results from sampling along the fringes of wastes will likely be inclusive due to

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[1] This is not a new issue and pointed out in our March 13, 2012 comments entitled: Review of "**Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18, February 8, 2012" (Attached).**

[2] The Tribe has commented on numerous occasions on the poor architecture of the RI/FS workplan with the seemingly endless amendments. The following is excerpted from the Tribe's Oct 13, 2014 comments entitled "Rapid review of ***"On-Property Focused Remedial Investigation Work Plan Amendment No. 10, Stream***

poor experimental design, likely resulting in subsequent efforts that are equally as onerous and time consuming as those proposed in this WP. The net result could be causing more delays, further benefiting the PRP at the expense of the Tribe and the General Public. Due to the shortcomings described above, much of this discussion is speculative. The Tribe has resigned to "wait and see", but selection of the Remedy as described under the NCP is a deliberative process—Not a gambling event.

Regardless, all is not lost. As pointed-out in our October 23, 2014 comments entitled: "Rapid review of ***"On-Property Focused Remedial Investigation Work Plan Amendment No. 10, Stream Sediment and Floodplain Soil Characterization in Beaver Dam and Pond Complex in the On-Property Reach of Leviathan Creek Leviathan Mine Site, Alpine County, California"***

> *Analysis of the XRF screening-level waste material data indicates that all of these material will likely exceed either single-COC-based ecological or human health risk-based thresholds. Magnitude and frequencies of exceedences of human and ecological risk-based thresholds (e.g. preliminary remediation goals) will greatly increase when the Tribes Human Health risk Scenario is employed and hazard indices are calculated.* ***This means that all of the waste rock will need to be addressed.*** [Emphasis added].

In other words, characterization of on-site materials is likely not a critical aspect of this case.

Sediment and Floodplain Soil Characterization in Beaver Dam and Pond Complex in the On-Property Reach of Leviathan Creek Leviathan Mine Site, Alpine County, California" …."Once again, the reader deserves some discussion on the other 9 amendments including the history of document development starting with initial document in 2010. The review package should include all of the components of the document that are under review. The Tribe has raised concerns in the past with piecemealing workplans and QAPPs. Again, balkanizing these documents makes it hard for technical personnel, let alone the public, to follow the process and rationale employed to make technical decisions. In general this approach appears to lack transparency.

[3] Comments in the Attachment and nearly all comments provided by the Tribe on the other 9 amendments (either on or off-properrty) apply to this document as well. In the spirit of expediency, the Tribe has elected to not reiterate those comments, but requests that they be addressed by the revised document.

Attachment 1: Tribe's March 13, 2010 Review of "Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18, February 8, 2012"

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-924-0184
http://www.aeseinc.com

MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: March 13, 2012

SUBJECT: Review of "**Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18, February 8, 2012**"

CC: Joy Peterson, Hydrogeologist, WTN&C
File

The Washoe Tribe has performed a rapid review of the aforementioned document. Typically, General Comments would be followed by Specific Comments; however, the nature and extent of the General Comments are such that a major rethinking followed by revision will be necessary. Therefore, Specific Comments are not provided herein.

Upon Review of ARCO's February 3, 2012 memo entitled "**Response to Comments Reference Area Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18**", it became apparent that EPA did not provide ARCO with the Washoe's full set of technical comments. This is concerning because the important message in these comments is that reconstruction of Pre-Release Baseline (PRB), for sediments/riparian soils from upstream of the mined-area to areas downstream of the confluence of the Carson River, must be the conducted prior to doing any-work associated with reference areas. This is because the reconstruction of PRB for these abiotic media is the basis for future reference area selection.

The lack of this understanding, is apparent by actions proposed in both the Reference Area FRI Workplan as well as the Off-Property FRI Workplan. If unaccommodated in

the workplans, this lack of understanding, will either result in major set-backs or will result in proposed remedies that are not protective of the Washoe and others.

The two sets of comments that were not transmitted by EPA to ARCO, but require incorporation into the aforementioned workplans are[1]:

1. The November 19, 2011 memo entitled: ***"November 18, 2011 conference call with EPA, LEVNRTC, and EPA's contractors regarding pre-release baseline/background"*** (Attachment A)

2. The November 5, 2011 memo entitled: "**Rapid review of "Draft: REFERENCE AREA FOCUSED REMEDIAL INVESTIGATION WORK PLAN, Leviathan Mine Site, Alpine County, California",** Atlantic Richfield Co, September 2011 (Attachment B).

Again, the "headwaters" of all risks attributable to the mine as well as services to receptors all originate with sediments/soils/solid-phase. Therefore, the concern for this site has always been with reconstruction of PRB of riparian soils/sediments—this must be done first to identify prospective reference areas for biotic and perhaps surface water resources.

Beyond the concerns identified in the attachments and the discussion above, we have also only recently realized that ARCO may be proposing an MIS/ICS-type sampling scheme for reference areas as well as potentially affected areas. The Tribe has concerns with applying such schemes for situations in which advection-dispersion processes have likely resulted in surficial chemical gradients that would likely be apparent within a single decisional unit (DU; i.e. DUs that are not homogeneous nor homogeneously heterogeneous and contain apparent surficial trends). More discussion on these concerns follow in the General and Specific Comments

[1] Concerns identified in these two documents prevail. Therefore, we strongly recommend that these two documents be reviewed prior to proceeding to the General Comments section below. The third attachment (Attachment C) should be reviewed while reviewing General Comment No. 8.

General Comments

1. The NCP is a regulation that focuses on the cleanup of releases of hazardous substances; therefore, any determination of risk to human or ecological receptors pertains to the incremental risk attributable to the release(s) alone—not risk caused by prerelease conditions such as risk from natural materials or by other exogenous factors.[2,3] Below are excerpts from pertinent portions of the NCP used in discussion with EPA Regions 1 and 10. Portions of the excerpts have been emphasized to expedite the argument.

> **§ 300.1 Purpose and objectives.**
>
> The purpose of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is to provide the organizational structure and procedures for preparing for and responding to **discharges of oil and releases** of hazardous substances, pollutants, and contaminants.
>
> .
> .
>
> **§ 300.5 Definitions.**
>
> *Pollutant or contaminant* as defined by section 101(33) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which **after release into the environment** and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring. The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under section 101(14) (A) through (F) of CERCLA, nor does it include natural gas, liquified natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas). For purposes of the NCP, the term pollutant or contaminant means any pollutant or contaminant that may present an imminent and substantial danger to public health or welfare of the United States.
>
> ***Release*** as defined by section 101(22) of CERCLA, **means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed**

[2] The term "risk" is not found in the definitions section of the NCP (40CFR300.5).
[3] The Spokane Tribe of Indian's (STI) Hazardous Substances Control Act explicitly defines risk as "risk attributable to the release" because the STI realized that in many instances EPA has incorrectly estimated total risk (risk attributable to the release in addition to risk that was already present prior to the release) when the NCP requires estimation of incremental risk alone.

> **receptacles containing any hazardous substance or pollutant or contaminant),** but excludes: Any release which results in exposure to persons solely within a workplace, with respect to a claim which such persons may assert against the employer of such persons; emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine; release of source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under section 170 of such Act, or, for the purposes of section 104 of CERCLA or any other response action, any release of source, byproduct, or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. 7901 et seq.); and the normal application of fertilizer. For purposes of the NCP, release also means threat of release.

To reiterate, the NCP is a regulation that focuses on the cleanup of releases of hazardous substances; therefore, any determination of risk to human or ecological receptors pertains to the incremental risk attributable to the release(s) alone—not risk caused by prerelease conditions such as risk from natural materials or by other exogenous factors.

Further, as stated in Attachment A,

> *Since EPA's analyses of human health risk and ecological risk are based on absolute risk, and not incremental risk attributable to the release[4], it is quite likely that cleanup values determined via both the BERA and the HHRA will not be able to be attained.[5] This is because natural mineralization in the area likely already exceeds these absolute-risk based thresholds for a handful of COCs. Since these absolute-risk based thresholds cannot be attained via cleanup, natural background/pre-release conditions will likely be the default cleanup level.[6,7,8]*

The approach outlined in the above inset, has technical and legal precedent—It is the approach applied in the ROD and subsequent CD for the Midnite Uranium Mine Superfund site located on the Spokane Indian Reservation. Although not

[4] Our understanding of CERCLA is that EPA is to address "excess risk" attributable from a release or releases from the site; however, in practice EPA relies on absolute risk in risk management decision making.

[5] In such instances, EPA will be employ institutional controls, such as signage, to protect human health

[6] Under CERCLA the PRP cannot be required clean-up to conditions that are more protective than natural conditions.

[7] This reality was realized when AESE was first hired by the Tribe in the late 1990s, and has been expressed to EPA back in that time frame on numerous occasions. The requisite cleanup levels governed by the Washoe Traditional uses of the area only serve to reinforce this assertion.

[8] At this point, the BERA and HHRA are merely pro forma and are not required for any meaningful decision making regarding cleanup.

readily apparent to EPA, PRB is intrinsically protective of Washoe's uses, since they have used this area for thousands of years. Anything less will likely result in a cleanup that is not protective of the Washoe. In other words, a cleanup designed for the generals public—a group that does not live there.

2. As discussed above, since PRB will likely be the ultimate cleanup-goal, even the slightest exceedence of PRB of any of the TAL metals will result in an incremental risk to the Tribe, that could exceed EPA's risk threshold. This means that none of the TAL listed COCs should be removed until it can be screened against PRB for each of the three Zones identified in Figure 1 (Also see Attachment B)

3. From the discussion above, in order to estimate the risk attributable to the release, EPA must first know the nature and extent of contamination prior to developing estimates of risk, otherwise, the estimates of risk are a mixture of risk attributable to the release and risk attributable to natural or pre-release conditions.

   The approach, described in the Workplans, is problematic since strategies for determining the nature and extent of contamination, differ markedly from those that would be employed to evaluate total risk.

   We also want to caution, that areally-averaged values used to provide a "provisional value for background" are not typically employed in the geologic profession where materials are likely heterogeneous (as described in the SCS reports for the various counties, and geologic maps of surficial materials for the area).

   In general, a geologist samples at multiple depths for the following reasons:

   1. point-values of reference materials for pre-release baseline are located beneath each contaminated sample.

   2. EPA must know the depth that COCs have penetrated in order to ensure that core sub-sampling does not result in obtaining a mixture of contaminated materials and background materials. This situation is common when a depth of sampling is specified arbitrarily (e.g. 0-6 inch deep is common for HHRA) and will result in dilution of the contaminated population likely resulting in false negative results (Type II error). This means that shallow coring is required. Such cores will retrieve both contaminated and pre-release samples within a single core.

   The Tribe has heard concerns from EPA's team regarding the presence of PRB sediments. Specifically, "we think that its could be hard to find PRB soils or sediments at locations downstream of the mine, because it is a down-cutting system". The Tribe strongly disagrees with this loose assumption and submits that relict PRB

sediments are likely found in key areas within the floodplain as well as in in-stream depositional areas (See Attachment B as well). [9]

4. The Order Requirements Section identifies the following objectives; however, the FRI work plans do not describe approaches to meet all of these objectives. Specifically, none of the proposed work focuses on reconstruction of pre-release baseline, which is a required to delineate the nature and extent of contamination.

> "The SOW identifies the objectives of the project and presents a framework of activities for the RI/FS as appropriate. General SOW requirements include: "plan and conduct those investigations necessary to characterize the Leviathan Mine Site and actual or potential contaminant migration pathways (Environmental Setting and Pathway Characterization); define the source (Source Characterization); **define the nature and extent of contamination (Contaminant Characterization);** identify actual or potential receptors (Receptor Identification); and conduct an assessment of risks posed to actual or potential receptors (Risk Assessment)." The SOW requires **that "all planning will be based on DQOs.**" [Emphasis added]

The inset statement is consistent with the approach described by the NCP; however, all subsequent actions described in the Work Plans focus on sampling to evaluate total risk, rather than the extent of contamination. In other words, it appears that EPA is looking at sampling to estimate total risk as the first screen or decision point, and if total risk is exceeded, *then* they will compare sample values to some arbitrary provisional value of background[10,11,12,13].

---

[9] If this statement is indeed true, the Tribe would be encouraged, because it means that the nature and extent is much smaller than anticipated. However, we will not know until a form informed sampling is employed,

[10] The approach makes little sense, since some of the natural uncontaminated soils likely exceed EcoSSL/R9PRGs.

[11] The term "background" as used by EPA in this document as well as many of its guidance documents is not equivalent to pre-release conditions, as required by the NCP. Therefore, "background" as described in the Workplan cannot be used to evaluate the risk attributable to the release.

[12] This provisional value of background if determined from site data will be an unknown weighted mixture of soils whose parent materials are unspecified and this mixture also will contain contaminated and natural soils. The resulting background cutoff (e.g. UCL95 for the COI population—not the mean) will be driven by the samples containing the highest COI, which is likely a contaminated sample or a sample that contains high natural levels of the COI, but only represents a very small area or volume of material.

[13] As described in General Comment No. 1, an estimate of pre-release conditions is necessary to estimate risk to the receptor that **is attributable to the release**. Since risk is receptor-specific, the exposure area or DU of a given receptor is defined by his anticipated home-range. This means that "background", although provisional must be determined on the same scale as the home range of the receptor of interest—its not some single value that is spatially independent, and sampling and estimation of prerelease conditions is not a simple endeavor as portrayed in the Work Plans.

The Tribe offers a time-tested approach involving short cores for such a reconstruction that is commonly relied upon by practicing professional geologists or hydrogeologists, in its comments that have been attached.

5. As stated above, the Tribe has numerous concerns with MIS/ICS schemes for situations in which surficial trends would likely be present within a single DU. This concern extends to the following time periods as well:

   - pre-release baseline (PRB),
   - the active mining period;
   - post mining, but pre-mitigation, and
   - post-mitigation to current conditions

   Please provide citations for which surficial MIS/ICS approaches have been employed to reconstruct these four situations. Please also provide a map and shapefiles depicting the proposed DUs, keeping in mind that the DUs are specific to the home-ranges of the targeted receptors (including humans).

   The Tribe also points-out that MIS/ICS approaches are likely not compatible the California Guidance (DTSCA, 1997). Therefore results likely would not meet ARARs.

6. The following statement suggests that ARCO believes that the ore-body was not a blind deposit (See Attachment No 2; General comment No 3 and Figure 1)

   the geology, mineralization, and alteration associated with Leviathan Mine are localized and do not extend to Bryant Creek;

   This definition means that there is a pre-mining fingerprint which would result in a surficial geochemical trend negating the applicability of MIS/ICS sampling. In such instances, surficial characterization using discrete samples with evaluation of scale or volume of geostatistical support is suggested.

   Figure 1 below, has been revised since the November 19, 2011 memo (Attachment A) to include locations along the longitudinal axis of a hypothetical dispersion curve that would likely be represent values obtained via Multi-Increment sampling (MIS) with compositing or Incremental Composite Sampling (ICS). In summary UCL95 (or another upper-end of a given distribution metric) representing the physical location of the cut-offs between Z1/Z2 and Z2/Z3 is necessary—means of means (of means) are useless for this characterization

7. Advection-dispersion modeling has been successfully used to model current or predict future spatial distributions of contaminants for nearly 100 years. However, as mentioned in the attachments, a rule of thumb is that 90% of the annual solids that are transported from a source occurs during 1-2 days of the year. This means that conceptually speaking, annual dispersion dominated transport events in the form of layers or varves are represented in the geologic record at depositional areas.

   The problem with the proposed technique of sampling only surficial deposits is that the resultant contamination is in layers and the surficial sampler does not know what layer he/she is sampling. Due to differential erosion and differential deposition, this approach leads to comparing concentrations of COCs derived from a variety of layers (mixed populations). This is why geochronological reconstruction is necessary. High-frequency sub-sampling of samples obtained via shallow cores and analysis of Cesium-137 (^{137}Cs) and TAL COCs is typically used to investigate these concerns, enabling geochronological reconstruction (Church and Kirschner, 2008; Church et al 2007)

8. In light of the numerous major concerns described above, the DQOs will need major revision to focus on PRB as the criteria that defines nature and extent of contamination as well as PRGs. The Washoe had provided comments on DQOs drafted for the PMP:

   November 6, 2008 memo entitled:

   > Review of ***"Draft Data Quality Objectives Report: Remedial Investigation and Feasibility Study, Leviathan Mine Alpine County, California, AMEC Geomatrix, Inc., October 2008"***

   However the drafting of the comments concluded as describe below:

   > *The drafting of this review ceased on November 5, 2008 at section 8.2, after discussion with EPA where they verbally assured us that DQOs, as defined by EPA guidance, would be deferred to the SAP/FSP portions of the project, diminishing the need for this document.*

Although the DQOs in this FRI document are qualified in terms of being "programmatic DQOs", and have tentatively been accepted by EPA (EPA 2010). The study-specific DQOs, like those described by EPA 2006, still need to be drafted and agreed upon by technical representatives of the participating governments. The Tribe resubmits AESE's DQO Worksheet and Decisional Flowchart (DFC) that has proven useful in the past at other sites.

References Cited

DTSCA, 1997, Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments a Hazardous Waste Sites and Permitted Facilities – Final Policy, Department of Toxic Substances Control.

Church, S.E., and Kirschner, F.E., 2008, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, Abstracts with Programs, Geological Society of America, v. 40, no. 6, p. 272.

Church, S.E., and Kirschner, F.E., LaDonna M. Choate, Paul J. Lamothe, James R. Budahn, and Zoe Ann Brown, 2007, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, USGS SIR 2007-5262.

U.S. Environmental Protection Agency (U.S. EPA), 2010a, Approval with Comments and Direction to Implement 2009 Draft Program Work Plan and Addendum for Remedial Investigation and Feasibility Study at Leviathan Mine Site, Alpine County California, November, 2009. May 13.

U.S. Environmental Protection Agency (U.S. EPA), 2006, Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 EPA/240/B-06/001

Figures

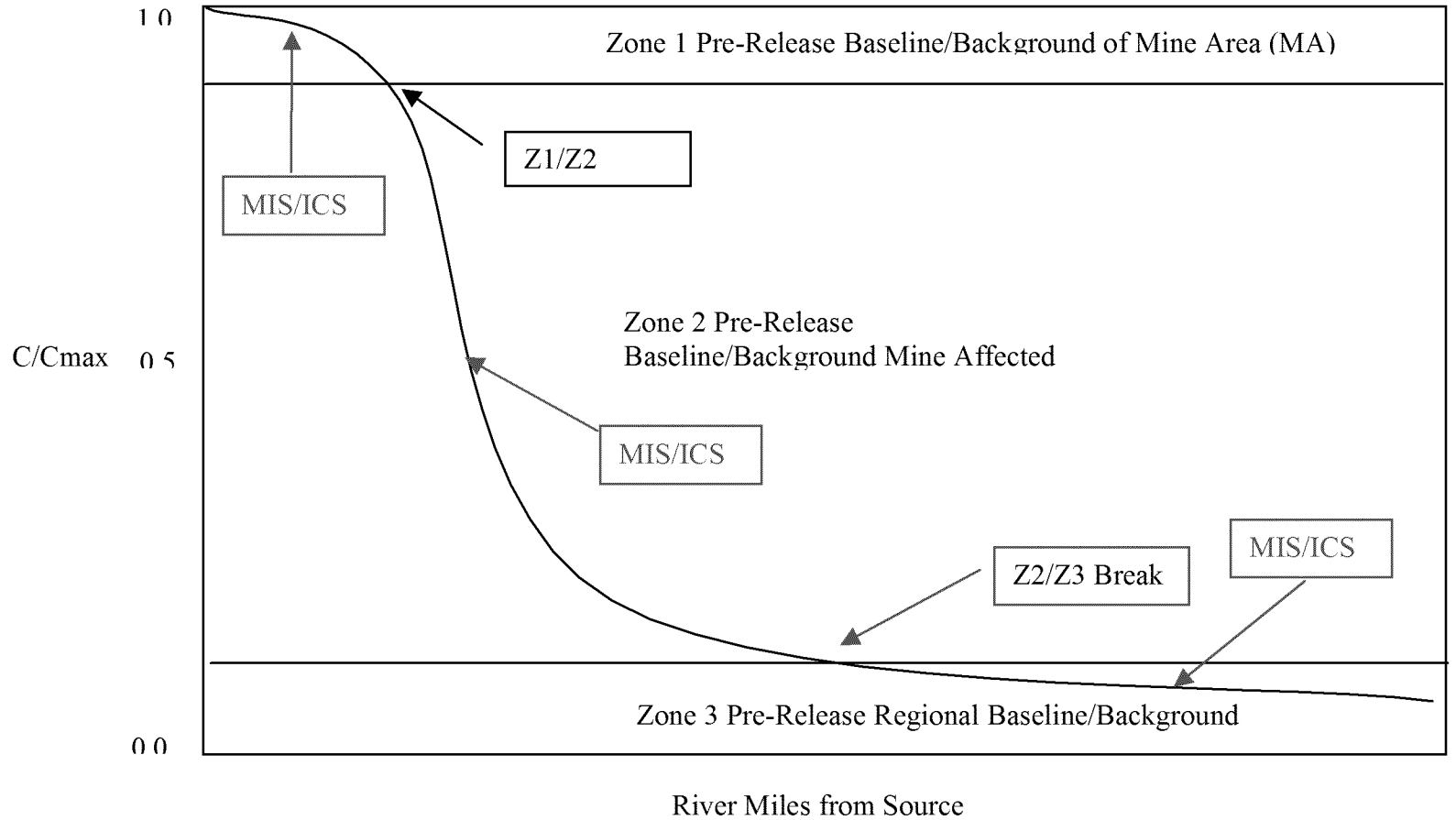

Figure 1. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a given **exposed ore-body**. Source zone (Zone 1), dispersion dominated or transition zone (Zone 2), and nearly unaffected regional background/baseline (Zone 3). After Church et al. (2007). This figure has been revised since the November 19, 2011 memo (Attachment A) to include locations alone the hypothetical dispersion curve that would likely be representative of Multi-Increment sampling (MIS) with compositing or Incremental Composite Sampling (ICS).

Attachment A: November 19, 2011 memo entitled: ***"November 18, 2011 conference call with EPA, LEVNRTC, and EPA's contractors regarding pre-release baseline/background"***

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-924-0184
http://www.aeseinc.com

MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: November 19, 2011

SUBJECT: November 18, 2011 conference call with EPA, LEVNRTC, and EPA's contractors regarding pre-release baseline/background

CC: Joy Peterson, Hydrogeologist, WTN&C
File

The conference call was be somewhat productive, but it was apparent that EPA and its contractors have not given pre-release baseline/background the requisite attention. EPA tentatively agreed during the call that since EPA's analyses of human health risk and ecological risk are based on absolute risk, and not incremental risk attributable to the release[1], it is quite likely that cleanup values determined via both the BERA and the HHRA will not be able to be attained.[2] This is because natural mineralization in the area likely already exceeds these absolute-risk based thresholds for a handful of COCs. Since these absolute-risk based thresholds cannot be attained via cleanup, natural background/pre-release conditions will likely be the default cleanup level.[3,4,5]

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[1] Our understanding of CERCLA is that EPA is to address "excess risk" attributable from a release or releases from the site; however, in practice EPA relies on absolute risk in risk management decision making.

[2] In such instances, EPA will be employ institutional controls, such as signage, to protect human health

[3] Under CERCLA the PRP cannot be required clean-up to conditions that are more protective than natural conditions.

[4] This reality was realized when AESE was first hired by the Tribe in the late 1990s, and has been expressed to EPA back in that time frame on numerous occasions. The requisite cleanup levels governed by the Washoe Traditional uses of the area only serve to reinforce this assertion.

[5] At this point, the BERA and HHRA are merely pro forma and are not required for any meaningful decision making regarding cleanup. Reference areas also are not necessary since PRB which has determined onsite *is* the restoration goal.

The discussion above highlights the importance of accurately determining pre-release baseline (PRB). Under these conditions, this work is more important to setting cleanup levels than the BERA or the HHRA. Further, if PRB is underestimated, large tracts of naturally mineralized areas would falsely be included as requiring cleanup. Alternatively, if PRB is overestimated, large areas that are actually affected by releases would not be included for cleanup. In past communications associated with the HHRA, the Tribe has recommended to EPA that two exposure areas or zones be defined:[6]

1. The mined area (MA; Zone 1 on Figure 1) and
2. The mining affected area (MAA; Zone 2 on Figure 1)

In order to define these zones and minimize the aforementioned errors, the break points between Zones 1-2 (MA/MAA) and Zones 2-3 (MAA/Regional Background) must be determined ***for PRB for the site***[7]—not determined via an arbitrary reconstruction by sampling adjacent areas deemed as "reference areas" based predominantly on location.

During the meeting it became clear that EPA and its contractors did not understand that AMEC is proposing to attempt to determine an arbitrary single value of "background" by sampling adjacent areas. EPA's and its contractor initially believed that AMEC would be sampling areas representing "eastern Sierra slope areas" to define the cutoff for Regional Background (break points between Zones 2-3); however, they finally realized that AMEC was also attempting to "fill Zone 2 bins" with some of their proposed locations (e.g. cinnabar ridge, presumably a naturally mineralized area). This issue may have been resolved via language stating that AMEC is only to be sampling to reconstruct regional background, but the Tribe needs to follow-through on this issue and needs to be convinced that EPA understands the importance of this work to determining cleanup goals.

References Cited

Church, S.E., and Kirschner, F.E., 2008, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, Abstracts with Programs, Geological Society of America, v. 40, no. 6, p. 272.

Church, S.E., and Kirschner, F.E., LaDonna M. Choate, Paul J. Lamothe, James R. Budahn, and Zoe Ann Brown, 2007, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, USGS SIR 2007-5262.

[6] This zonal approach is applied by EPA in the ROD for the Midnite Uranium Mine Superfund Site, Washington.

[7] Breakpoint for Zone2/3 could be UTL95 of samples obtained regionally for Zone 3; Breakpoint for Zone 1/2 must be determined onsite using core as described by Church and Kirschner (2008) and Church et al (2007)

Figures

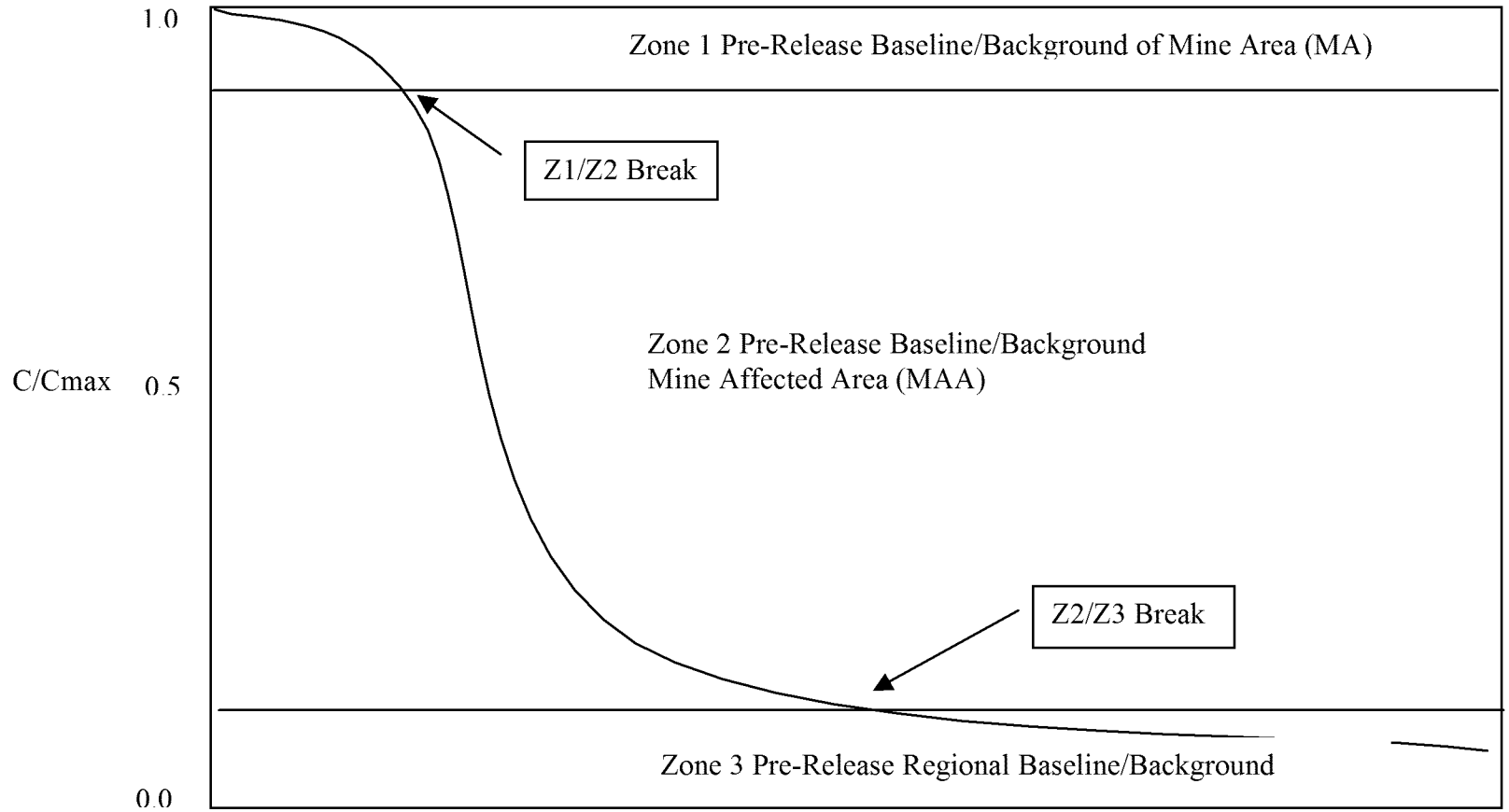

Figure 1. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a given **exposed ore-body**. Source zone (Zone 1), dispersion dominated or transition zone (Zone 2), and nearly unaffected regional background/baseline (Zone 3). After Church et al. (2007).

Attachment B: November 5, 2011 memo entitled: "**Rapid review of "Draft: REFERENCE AREA FOCUSED REMEDIAL INVESTIGATION WORK PLAN, Leviathan Mine Site, Alpine County, California",** Atlantic Richfield Co, September 2011

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-924-0184
http://www.aeseinc.com

MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: November 5, 2011

SUBJECT: Rapid review of ***"Draft: REFERENCE AREA FOCUSED REMEDIAL INVESTIGATION WORK PLAN, Leviathan Mine Site, Alpine County, California", Atlantic Richfield Co, September 2011***

CC: Joy Peterson, Hydrogeologist, WTN&C
File

The Washoe Tribe has performed a rapid review of the aforementioned document. General Comments are followed by Specific comments.

General Comments

1. In the context of CERCLA, reference areas serve as experimental controls used to compare attributes of site affected media to non-site affected media.[1] Prospective candidate reference areas, cannot be proposed until this reference population has been characterized and understood.

   On Page 8 section 3.3 Task 1, the Work Plan cites EPA Guidance:

   > ***An ideal reference area would have the same physical, chemical, geological, and biological characteristics as the site being investigated (U.S. EPA, 2002).***

   The problem is that the definition is the "same ***as but for the release***".

   Since all biologic and human services provided by a given affected area originate with the abiotic media[2] (i.e. surface water, ground water, sediment, soils, and air), pre-release baseline (PRB) of the abiotic media must first be determined to ascertain the qualities of these media prior to mining. Once abiotic media-specific PRB has been determined, prospective candidate reference areas likely to have similar biotic characteristics as PRB (i.e. flora and fauna, but for the release) can be identified and characterized and winnowed-down to a few reference areas for PRB. Finally, comparisons between abiotic and biotic media sampled at both the potentially impacted area (PIA) and the PRB reference areas can be made to ascertain the affects of mining.

   This approach differs markedly from that proposed in the work plan, where reference areas are proposed based on general conditions that do not include chemical characterization of the abiotic materials as an important attribute.

2. A mine/orebody is defined as a volume of rock or material that contains target minerals that can be extracted, milled, and marketed to yield a profit—A mine is not defined by the highest concentration of the target mineral. This means that other prospective reference areas likely have equally high concentrations of COIs as the PIA or even the mine area; however, the volume of material was too small to be economically feasible to extract at the time mining occurred. Based on the general

[1] Much like in a laboratory setting where attributes of treated individuals are compared to control (untreated individuals) to discern a caused measurable change in attribute or condition.

[2] Abiotic media are the foundation or basic building blocks of any environment. EPA has long-realized this relationship and assesses risk by modeling up-chain transfer from the abiotic media. EPA also manages or remediates the abiotic media.

geology depicted in the provided map[3], it is highly likely that contaminants of interest (COIs) measured at points in the candidate reference areas could exceed concentrations of COIs measured at points in the PIA prior to releases from mining. If this occurs, the proposed design and proposed statistical approach will result in falsely biasing-high the geochemistry or other measured attributes of the prospective reference area(s).

3. Since PRB of sediments along Leviathan and Bryant creeks is unknown because the potentially impacted area (PIA) of the site area has covered or buried PRB sediments and the physical system has been altered via mining, PRB chemistry of sediments will need to be reconstructed prior to proposing reference areas for further analysis. Geochemical reconstruction should be conducted in a manner depicted in Church and Kirschner (2008) and Church et al. (2007) using environmental tracers and high-resolution sub sampling of cores from depositional areas, including riparian soils, where over bank spills have occurred during flooding events.[4]

   Once, this work has been accomplished and the premining status of the orebody has been determined (i.e. was the deposit fully exposed or fully buried ("blind") prior to mining; Figures 1-3), reconstruction of pre-mining baseline of ground water, surface water, and soils can be initiated . Selection of candidate reference areas for characterization and subsequent evaluation of effects on biotic media associated with the three zones depicted in Figure 4 cannot occur until these reconstructive steps have been finalized.

4. The off-property work plan (zones 2 and 3 of Figure 4) and subsequent work also should not be completed prior to performing the reconstruction abiotic PRB reconstruction described above.

   This work must be completed prior to selection of reference areas since we need to first know the nature and extent of contamination (as interpreted via cores of sediments and riparian soils) to allow us to develop a target range of COIs in reference areas for zones 1-3 (Figure 4). Again there is a need to demonstrate that candidate reference areas fall within the anticipated range of concentrations of abiotic media. This work will likely require back and forth analysis of both areas, but it would be very helpful to have the results of the cores first.

---

[3] Analysis of soil maps for this region would likely indicate the aforementioned distribution is even more highly variable than depicted by the geology maps

[4] Correctly located cores contain sediments/soils representative of both pre and post release geochemical conditions at a given locations. Characterization of PRB of geochemical conditions is then used to prospect for appropriate reference areas that support biota representing populations that would likely be present, but for the release.

5. The DQOs portion (Section 4) needs to be redrafted in light of concerns described above as well as in the Specific Comments, below. Notwithstanding the aforementioned concerns, decisions goals and decision statements contain two or more compound questions that are unrelated or mutually exclusive.

   Step 4 or Boundary definition. The Target population, for example, is sediments that represent PRB in each of the 3 (or 2) reaches. The DQOs still really miss the mark and do not specify data quality required to perform the statistical comparison tests (or even the tests). Again all testing and acceptance/decisional criteria must be specified apriori, preferably in this document.

6. According to the SAP (Section B1.1),

   > *The RI/FS Program Work Plan outlined the overall tiered approach for completing the RI/FS for the Leviathan Mine Site. This approach proposed that additional details (e.g., rationale, methods, locations, and frequency) would be provided within the FRI work plans and the Focused Feasibility Study work plans. This approach was approved by the U.S. EPA in response to Atlantic Richfield's December 15, 2008, proposal for producing the RI/FS Work Plan in stages (U.S. EPA, 2009).*

The SAP was briefly reviewed. In light of the previous concerns as well as those described in the Specific Comments section below, since the SAP is inextricably linked to the FRI WP, the SAP will also require a substantial revision. The Tribe believes a thorough review of the SAP as well as the other Appendices is not warranted at this time.

Specific Comments

1. Page 7; Section 3.0; Sentence

> *To support the selection of reference streams, the initial Reference Area activities were conducted as described in a September 15, 2010, letter to the U.S. EPA (Atlantic Richfield, 2010c) and approved by the U.S. EPA by email on October 19, 2010 (U.S. EPA, 2010d).*
>
> .
> .
> .
> *Finally, reference stream reaches were selected for each site stream reach.*

Please describe the logic supporting this work prior to developing to data quality objectives to identify candidate reference areas. Also see General Comment No. 1.

2. Page 8; Section 3.1; Last Paragraph 1:

> *The Programmatic DQOs recognized that locating an undisturbed ore deposit similar to Leviathan Mine that can be used as a reference area is unlikely. Therefore, finding the perfect reference stream is also unlikely, and the evaluation of potential reference streams needs to include a thorough evaluation of the key characteristics of the site stream reaches as compared to the potential*

Please cite and provide evidence directed at the status of the pre-mining orebody. Has it been formally established that that deposit was not essentially blind?

This statement highlights the need for the work identified in General Comment No. 1 to be conducted (as well, as work in the down stream areas) prior to any work associated with identifying candidate reference areas.

3. Page 8; Section 3.1; Paragraph 1:

> An ideal reference area would have the same physical, chemical, geological, and biological characteristics as the site being investigated (U.S. EPA, 2002). In order to characterize the physical, chemical, geological, or biological variability of the site, key site characteristics were identified:
>
> - Sediment storage or transport, and number of tributaries;
> - Chemical variability – hardness, dissolved organic carbon, pH, temperature, major cations (calcium, magnesium, sodium, and potassium), major anions (sulfate and chloride), and alkalinity;
> - Geological variability – mapped rock type and mineralization; and
> - Biological variability – terrestrial habitat type. Physical variability – elevation and stream characteristics of flow rate, gradient,

See General Comment No. 1. The true definition of reference is same as "but for the release". Many if not all of these "the key characteristics" described above likely have changed or have been influenced as a result of historic and present releases or physical actions that have occurred during mining (e.g. landslide, aspen creek reroute, etc., some changes are described in the Draft BERA problem formulation document)

4. Page 11; Entire Section 3.6.1:

The geologic section of this report, which is likely the most important section from a similitude standpoint, is very weak. Again, the pre-mining conceptual geology needs to be reconstructed prior to any further work. See General Comment No. 1.

5. Page 13; Entire Section 3.6.3:

Like the geology section, the geomorphology section also is very weak and in some instance not necessarily correct. Like the geology section, most of this discussion are directed at post.
Mining likely has supplied significant amounts of sediment/debris to the point that downstream geomorphology has been affected. Again this discussion has little bearing on the identification of candidate of reference streams.

6. Page 36; Section 3.2; Paragraph 1: Sentence 2

The alternative outcomes are:

1. Concentrations of site COPCs are higher than concentrations of Reference Area COPCs. Site COPCs may present an unacceptable risk to human or ecological receptors and complete exposure pathways need to be evaluated through further study.

This statement contains two separate, unrelated questions that have different DQOs

7. Page 36; Section 3.1; Paragraph 2: Sentence 1

Decision statements are:

.

.

2. Do site concentrations of COPCs exceed reference values for potentially complete exposure pathways?

Same as previous comment.

1. Are PIA COPCs statistically different than Reference areas COPCs? if yes then:

2. Is Unacceptable risk involved? if yes then:

3. Disposition of PIA via NCP 9 criteria

8. Page 39; Section 4.4; Paragraph 1: Sentence 1

The Target population, for example, is sediments that represent PRB in each of the 3 (or 2) reaches. The DQOs still really miss the mark and do not specify data quality required to perform the statistical comparison tests (or even the tests). Again all testing and acceptance/decisional criteria must be specified a priori, preferably in this document.

9. Page 39; Section 4.4; Paragraph 1: Sentence 2:

> *Decision units will be defined for soil, floodplain soil, and sediment sample collection where the MIS protocol is used.*

The acronym "MIS" is not defined in the document.

10. Page 39; Section 4.6; Paragraph 1: Sentence 1:

> *For tasks that involve collecting analytical data, decision rules as statistical hypothesis tests (e.g., on-property COPC concentrations are greater than reference COPC concentrations) are set and a criterion is set for acceptable limits on estimating uncertainty.*

This is regurgitation of guidance and work should appear in this document at this location. Regardless, this information needs to be determined and agreed upon by all parties prior to initiating any work.

11. Page 55; Section 6.0; Paragraph 1: Sentence 2:

> *A minimum of five site and five reference-area samples will be required to conduct the analysis outlined below.*

Please provide the all of underlying calculations and all of the assumptions used to determine these minima. This type of discussion should be reserved for the DQO section of this report.

12. Page 55; Section 6.0; Paragraph 1: Item 1:

> *1. Upper bound concentrations (the lower of the maximum concentration or the 95th upper confidence level) reported for a relevant reference-area data set will be compared to the maximum concentration reported for a specific decision unit. If the maximum (or upper-bound) concentration for reference-area value is greater than the maximum value for the decision unit data, the chemical will be eliminated as a COPC for a specific decision unit. If not, proceed to Step 2.*

Decision units are reaches by media. For example sediments likely only require reference areas for Zone 1 and 3 as discussed earlier. If mountaineer and others tributaries are believed to historically contribute minimal flow and metals to Leviathan Creek, and R1=Rn, then a single reference area could be used for surface water. Again,

the selection of reference areas portion of the project requires much more thought and work.

13. Page 55; Section 6.0; Paragraph 1: Item 2:

> *Data from the decision unit and reference-area data sets will be compared using cumulative probability (Q-Q) plots generated using the U.S. EPA's ProUCL software, Version 4.00.05 (U.S. EPA, 2009e). The Q-Q plots compare two probability distributions by plotting their quantiles against each other….*

This is not consistent with EPA guidance and this method does not provide a quantitative comparison of populations. Generally hypothesis test such as "H_o PIA population = reference population" (= .05 = .90 are employed). Other approaches involving cutoffs determined for the reference areas are employed (e.g. UTL95, UCL95, or maximum value sampled from the reference population).

Specific Comments (Figures)

Figure 3. The watershed for Leviathan creek is not correctly depicted. Recommend drawing drainage basins for each stream using different annotation/color. Also appears that a leg of Mountaineer is missing.

Figure 5. Station 4L has been omitted

Figure 7. Reader would benefit by addition of bedrock geology and topography.

References Cited

Church, S.E., and Kirschner, F.E., 2008, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, Abstracts with Programs, Geological Society of America, v. 40, no. 6, p. 272.

Church, S.E., and Kirschner, F.E., LaDonna M. Choate, Paul J. Lamothe, James R. Budahn, and Zoe Ann Brown, 2007, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, USGS SIR 2007-5262.

Figures

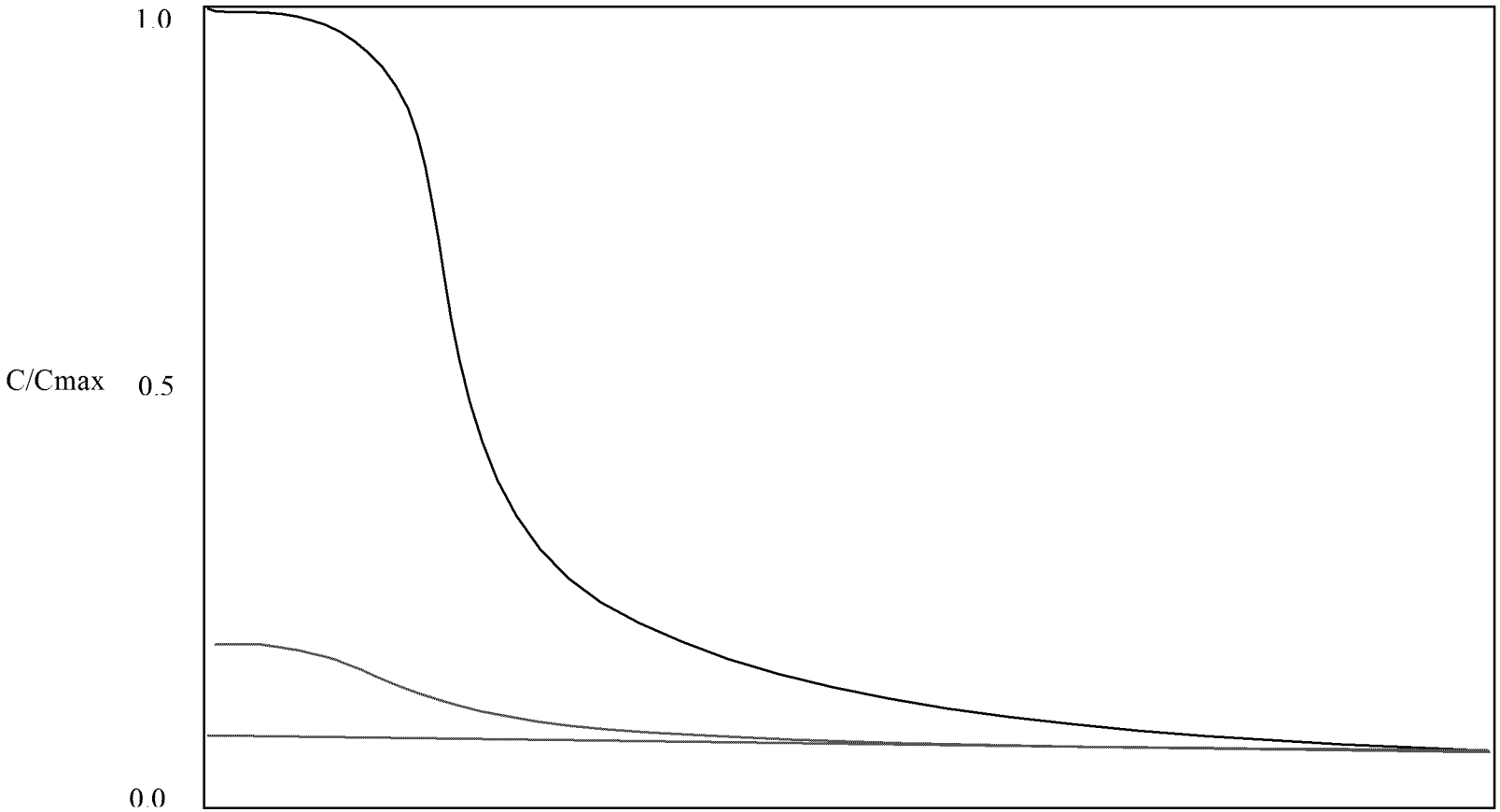

Figure 1. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a mine for three situations: Ore body fully exposed at the surface (black), "blind" deposit (red), and deposit that is partially exposed at the surface or the groundwater to surface water pathway daylights near the ore-body. Cmax = maximum concentration of the given COC observed in the three areas **prior too mining**.

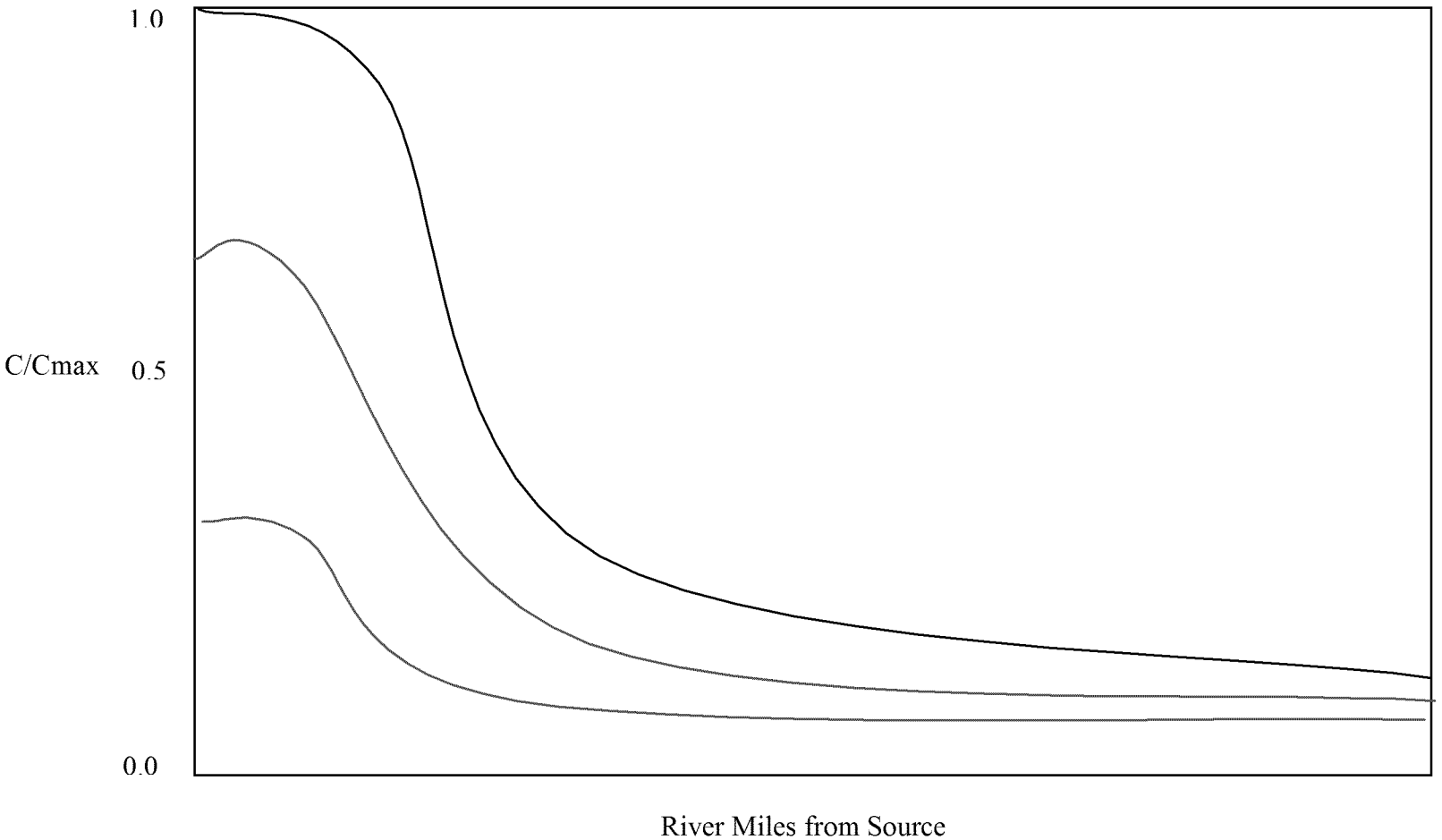

Figure 2. Hypothetical **pre-mining baseline** (blue), **post mining baseline** (red) and **during mining baseline** (black) concentrations of a given COC measured in sediment at various distances from a given mine where the ***orebody was exposed prior to mining***. Cmax = maximum concentration of the given COC observed in the area over all times.

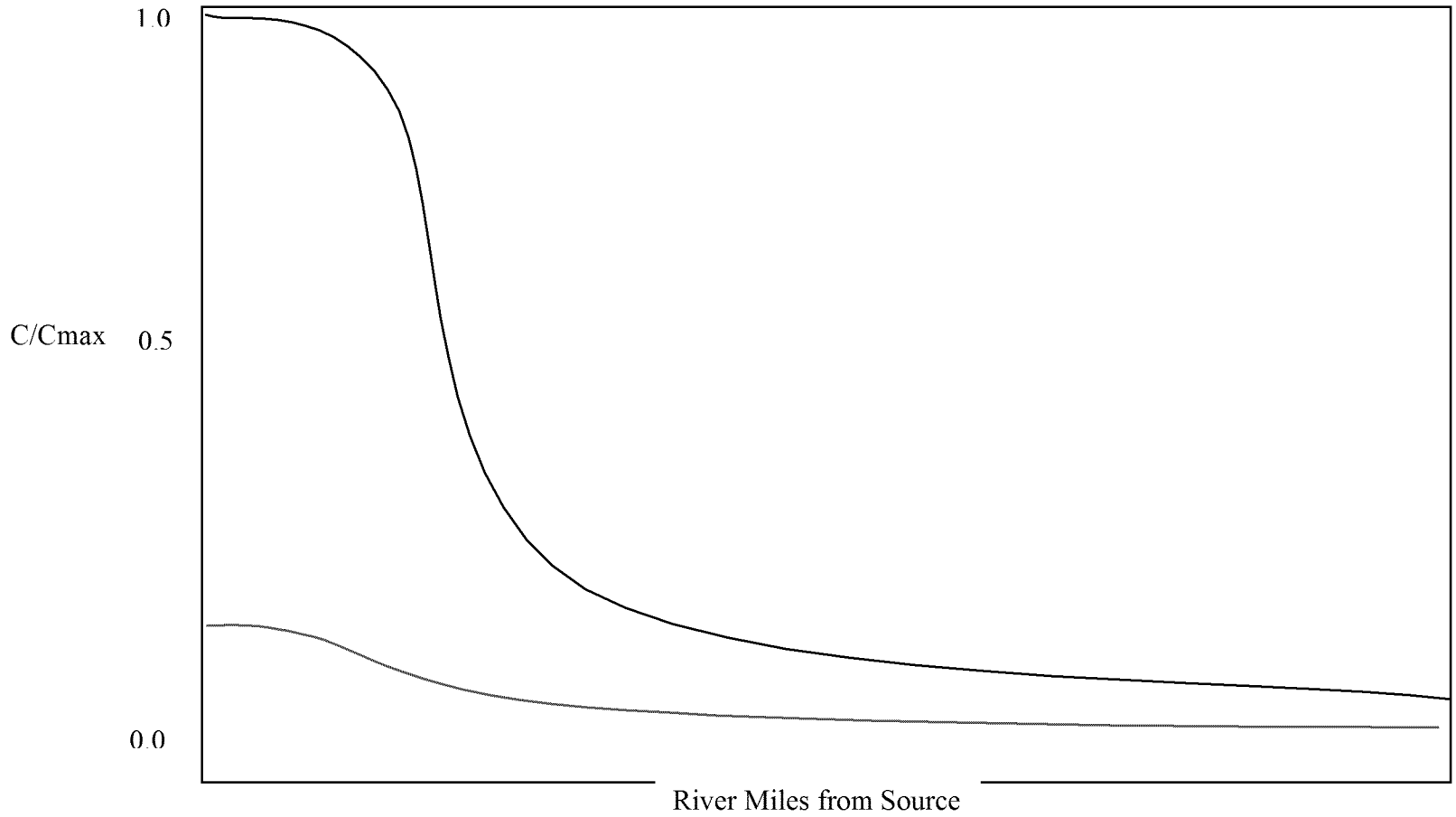

Figure 3. Hypothetical **pre-mining** (blue) and **post mining** (black) baseline concentrations of a given COC measured in sediment at various distances from a given mine ***where the orebody was exposed prior to mining***. Area between the curves defines the longitudinal nature and extent of contamination caused by the release(s). Cmax = maximum concentration of the given COC observed in the area over all times.

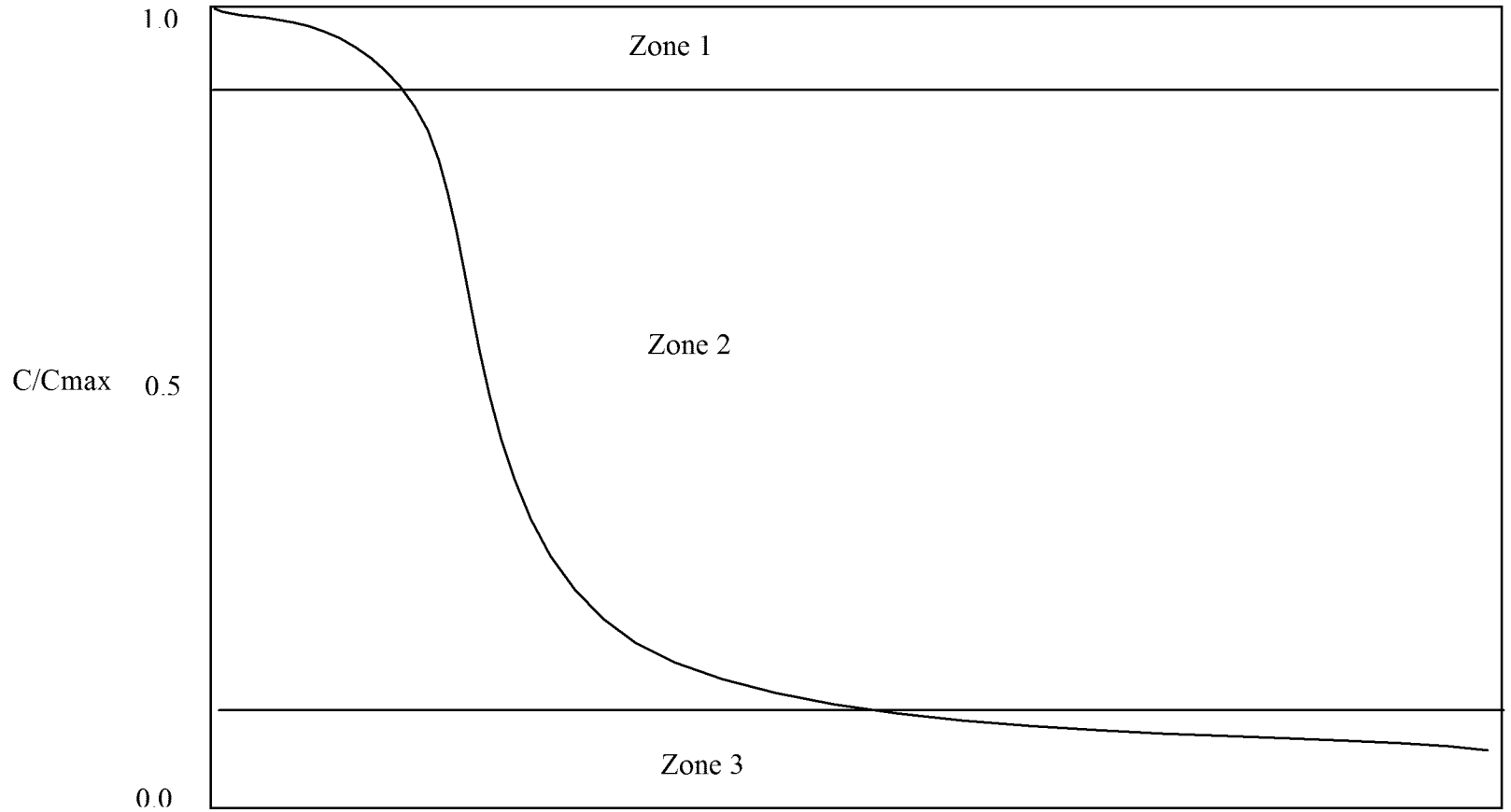

Figure 4. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a given **exposed ore-body**. Source zone (Zone 1), dispersion dominated or transition zone (Zone 2), and nearly unaffected regional background/baseline (Zone 3). After Church et al. (2007).

Attachment C: AESE DQO Worksheet and Decisional Flowchart (DFC)

Appendix A: DQO Worksheet

Table of Contents

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1.0 Introduction to Data Quality Objectives (DQO) Process

EPA (2000) provides guidance on development of Data Quality Objectives (DQO) for a single study. However, the document does not adequately describe how DQOs for each study are developed using the Preliminary Conceptual Site Models (PCMs). An example is given below in which DQOs for a single study (identified as a box or arrow on the PCSM) is developed in the absence of all existing data. Ultimately these DQO's are compared to existing data to determine if the existing data meet the required DQOs. Shortfalls in the existing data are data gaps in which further study/field work may be necessary.

This Attachment describes the Process for Data Gaps Analysis from a top-down perspective. This attachment contains four sections: Section 1.0 is a brief introduction to the DQO and Data Gap Analyses Processes. Section 2.0 describes how the Data Gaps are identified for and entire project which is comprised of numerous studies that are described by the Conceptual site Model. Section 3.0 describes the data quality objectives (DQO) process, Section 4.0 presents the DQOs for a single medium study (e.g. soil sampling), and Section 5.0 presents the references used to develop this attachment.

2.0 DQOs and the Procedure for Data Gap Analysis

Following the scientific process, every study, being historic or future, being large or small has DQOs driving the study design.

1. PCSM used as visual accounting tool to determine what studies would be necessary in the absence of all historic data (Sometimes called data needs). An example PCSM is depicted in Figure 1. Each box and arrow on the PCSM identifies a medium or flux that requires initial investigation.

2. DQO's are then derived for each and all of these studies. The result of this work are published in a stand alone DQO document. It is worthy to note that several disciplines including, but not limited to Physical scientists responsible for characterizing media for contaminant transport and fate and determining the nature and extent of contamination; human health risk assessors, and ecological risk assessors all likely have different data needs and therefore different DQOs for each medium.

3. Historic studies (and their DQO's, if known) are compared to the freshly derived DQO's in Step 2 to develop necessary studies (sometimes referred to study-gaps) and identify

datagaps. The list of deficiencies are termed Studygaps or datagaps.

5. The DQOs are then used to design the new studies that fill the studygaps and datagaps identified by the different disciplines

6. Studies are conducted

7. The performance of studies are determined by comparing the results to DQOs

3.0 Study-Specific Data Quality Objectives Process

An example for development of a single DQO, for a single study, by the human health risk assessment team, for a single medium (soils in this case) is given below. The example employs a decisional flow-chart to frame the DQO question or problem at hand (Figure 2).

The U.S. Environmental Protection Agency (EPA) DQO process was used to identify the specific needs for the project and to establish decision rules for the collection of soil sampling data. The DQO process is a seven-step iterative planning approach used to prepare plans for environmental data collection activities and is intended to help site managers plan to collect data of the right type, quality, and quantity to support defensible site decisions. The seven steps are as follows:

1.. State the Problem - Summarize the contamination problem that will require environmental data, and identify the resources available to resolve the problem; develop the conceptual site model (See Figures 1 and 2)

2.. Identify the Decision -. Identify the decision that requires environmental data to address the contamination problem (Figure 2).

3.. Identify Inputs to the Decision - Identify the information needed to support the decision and specify which inputs require new environmental measurements (Figure 2).

4.. Define the Study Boundaries - Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision (Figure 2)

5.. Develop a Decision Rule - Develop a logical "if.. . then.. ." statement that defines the conditions that would cause the decision-maker to choose among alterative actions (Figure 2).

6.. Specify Limits on Decision Errors — Specify the decision-maker's acceptable limits

on decision errors, which are used to establish performance goals for limiting uncertainty in the data (Figure 2)

7.. Optimize the Design for Obtaining Data - Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQO (This step is not portrayed herein)

4.0 Medium Sampling Plan Data Quality Objectives

This section details the DQOs as they relate to a sampling plan for a given medium at a given site. The section uses the format presented in Data *Quality Objectives Process for Hazardous Waste Site Investigations* (EPA, 2000).

Step 1. State the Problem

1. Identify members of the planning team
2. Identify the primary decision-maker
3. Develop a concise description of the problem
4. Specify available resources and relevant deadlines for the study

Step 2. Identify the Decision

1. Identify the principal study questions.
2. Define alternative actions that could result from resolution of the principal study questions.
3. Combine the principal study questions and the alternative actions into a decision statement
4. Organize multiple decisions

Step 3. Identify Inputs to the Decision

1. Identify information that will be required to resolve the decision statement
2. Determine the sources for each item of information required
3. Identify the information that is needed to establish the action level

4. Confirm the appropriate measurement methods exist to provide the necessary data

Step 4. Define the Boundaries for the Study —

1. Specify the characteristics that define the population of interest
2. Define the spatial boundary of the decision statement
3. Define the temporal boundary of the decision statement
4. Define the scale of decision-making
5. Identify practical constraints on data collection

Step 5. Develop a Decision Rule

1.. Specify the statistical parameter that characterizes the population of interest.
2. Specify the action level for the study
3. Develop a decision rule (an "if. . . .then...." statement)

Step 6. Specify Tolerable Limits on Decision Errors

1. Determine the range of the parameters of interest
2. Identify the decision errors and choose a null hypothesis
3. Specify a range of possible values of the parameter of interest where the consequences of decision error are relatively minor
4. Assign probability values to points above or below the action level that reflect the tolerable probability for the occurrence of decision errors.

Step 7. Optimize the Design — Soil Sampling Program

1. Review the DQO outputs and existing data
2. Develop general data collection design alternatives
3. Formulate the mathematical expressions necessary for each design alternative

4. For each data collection design alternative, select the optimal size that satisfies the DQOs

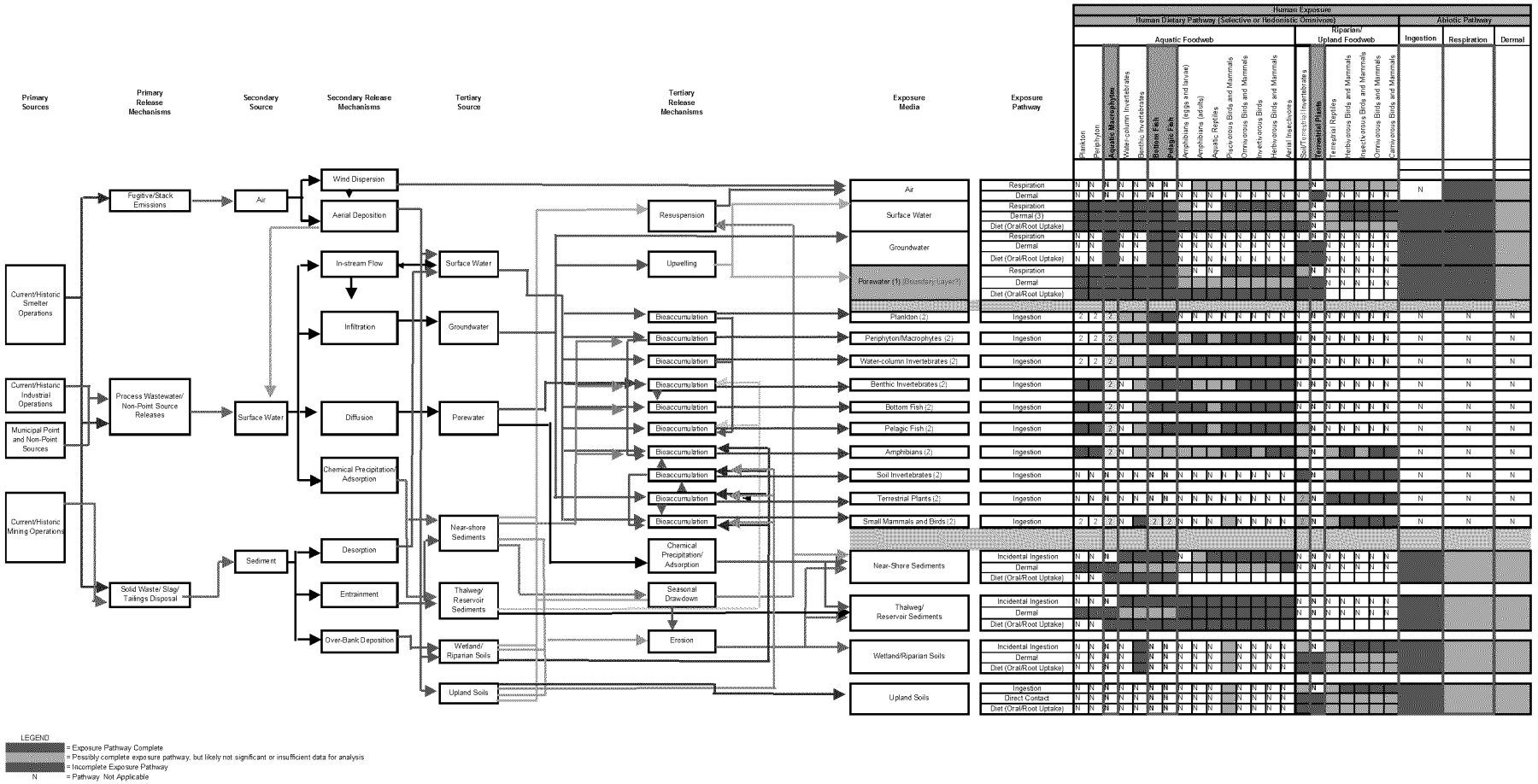
5. Select the most resource-effective data collection design that satisfies the DQOs

6. Document the operational details and theoretical assumptions of the selected design in the sampling and analysis plan

5.0 References Cited

U.S. EPA, 2000, Data Quality Objectives Process for Hazardous Waste Site Investigations EPA QA/G-4HW Final, EPA/600/R-00/007 January 2000.

Figure 1. Example Preliminary Conceptual Site Model for a Generic Lacustrine/Riverine Site in the Western U.S. The basic interaction between ecological and human receptors (Native Americans or others who rely heavily on site resources) are also depicted.



LEGEND

= Exposure Pathway Complete
= Possibly complete exposure pathway, but likely not significant or insufficient data for analysis
= Incomplete Exposure Pathway
N = Pathway Not Applicable

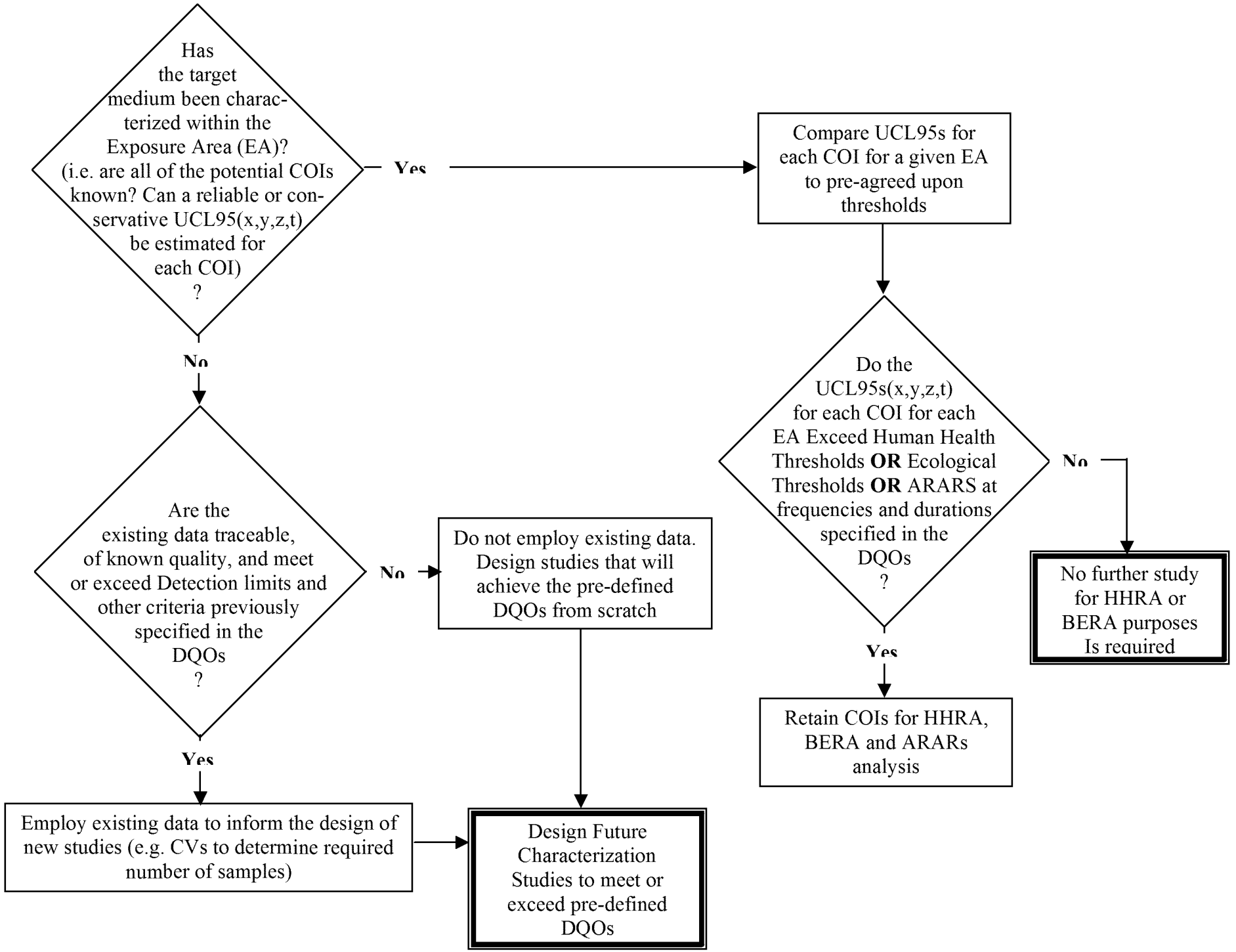
Red outlined columns are dominant HH media/pathways

1. By definition, porewater IS groundwater. (No need to add more confusion of terms... Clean Porewater Act?)
2. Upon death, Receptor contributes, as solid-phase and liquid-phase detritus to the dietary, dermal, and incidental ingestio n pathways ...dietary is probably of importance
3. Chemisorption onto external organic material
4. Inhalation of COCs contained in media via Sweatlodge pathway

Pathways required for HHRA as well as FS remedial design (ultimate remedial design will hinge on ability to discriminate betwee n the source of Dose to fish i.e. sediment or surface water)

Fish
- Ingestion (Diet)
- Dermal
- Sediment Resident Organisms
- Ingestion
- Dermal

Figure 2. Example Decisional Flow Chart (DFC) for characterization of a given medium (represented as a single "Box" in a wire-frame style preliminary conceptual site model (PCSM). The DFC, along with predefined DQOs, the PCSM, and Existing Studies/data (that have been evaluated to determine if they meet the predefined DQOs) are the basis for Data Gaps or Study gaps Analyses. In other words, The DFC, along with predefined DQOs, the PCSM defines what is needed (in the absence of any data): Existing Data are what we have. Datagaps are the shortfalls in the ability of Existing Data to meet the DQOs (or data needs).


Has the target medium been characterized within the Exposure Area (EA)? (i.e. are all of the potential COIs known? Can a reliable or conservative UCL95(x,y,z,t) be estimated for each COI) ?
Yes
Compare UCL95s for each COI for a given EA to pre-agreed upon thresholds
No
Are the existing data traceable, of known quality, and meet or exceed Detection limits and other criteria previously specified in the DQOs ?
No
Do not employ existing data. Design studies that will achieve the pre-defined DQOs from scratch
Yes
Employ existing data to inform the design of new studies (e.g. CVs to determine required number of samples)
Design Future Characterization Studies to meet or exceed pre-defined DQOs
Do the UCL95s(x,y,z,t) for each COI for each EA Exceed Human Health Thresholds OR Ecological Thresholds OR ARARS at frequencies and durations specified in the DQOs ?
No
No further study for HHRA or BERA purposes Is required
Yes
Retain COIs for HHRA, BERA and ARARs analysis

Attachment 3: Review of "**Addendum No. 1 - Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18**" . (FK_Offproperty_FRI_Add1_Comments.doc)

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-590-3758
http://www.aeseinc.com

MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: June 18, 2012

SUBJECT: Review of "**Addendum No. 1 - Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18"**

CC: Joy Peterson, Hydrogeologist, WTN&C
Kevin Mayer, EPA RPM
Anthony Brown, BP RPM
File

The Washoe Tribe has performed a rapid review of the aforementioned document. General Comments are followed by Specific Comments.

The "Introduction" describes two meetings between ARCO and EPA that led to the proposed Addendum:

> *This addendum to the Off-Property FRI Work Plan was requested by the U.S. EPA in conference calls with Atlantic Richfield representatives held on March 13 and April 4, 2012. During the March 13, 2012 conference call, the U.S. EPA provided preliminary comments on the phased approach outlined in the Off-Property FRI Work Plan and indicated that they were supportive of the proposed phased approach for the off-property investigations (as shown in Figure 2).*

The Washoe Tribe did not agree to this approach of phasing investigations without having a comprehensive understanding of the proposed work beforehand. Furthermore, the Washoe's March 13 comments entitled "**Off-Property Focused Remedial**

Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18, February 8, 2012" (Attached) could not have been contemplated during the first meeting. These comments, which were substantial, requiring a full re-write of the draft prior to proceeding, were transmitted directly to EPA and ARCO on March 13. However, judging from the content of "Addendum No. 1", the Washoe's technical comments were not contemplated nor addressed. This disregard of the Washoe's comments by EPA as well as ARCO is viewed as a fatal flaw of the RI/FS design process and is not the first time we have raised this type of concern (See Attachment). Specifically:

> *Upon Review of ARCO's February 3, 2012 memo entitled "**Response to Comments Reference Area Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18**", it became apparent that EPA did not provide ARCO with the Washoe's full set of technical comments. This is concerning because the important message in these comments is that reconstruction of Pre-Release Baseline (PRB), for sediments/riparian soils from upstream of the mined area to areas downstream of the confluence of the Carson River, must be the conducted prior to doing any-work associated with reference areas. This is because the reconstruction of PRB for these abiotic media is the basis for future reference area selection.*
>
> *The lack of this understanding, is apparent by actions proposed in both the Reference Area FRI Workplan as well as the Off-Property FRI Workplan. If unaccommodated in the workplans, this lack of understanding, will either result in major set-backs or will result in proposed remedies that are not protective of the Washoe and others.*

General Comments

1. The approach of attempting to patch or salvage previous work via addenda will likely result in future confusion and raises numerous questions: For example:
    a. Does the AOC enable use of addenda in this manner?
    b. This is "Proposed Addendum 1", but how many addenda will EPA allow?
    c. How will future readers, including management, be able to track what is actually planned to occur here?

2. The Proposed Addendum 1 appears to demote the **Off-Property Focused Remedial Investigation Work Plan for the Leviathan Mine Site** to merely reconnaissance-level work that is not based on DQOs as portrayed in EPA QA/G-4. ARCO also states:

> *"The U.S. EPA issued approval of the surface water monitoring program in a letter dated April 10, 2012 and qualified their approval by stating that the monitoring program could be modified as data quality objectives (DQOs) for off-property investigations are further developed."*

Is this management approach consistent with EPA QA/G-4?, the AOC?, the NCP?

3. The term "significant" or "significantly different" are used without specification. Hypothesis tests including level of significance (□ and □) as required by EPA QA/G-4 have still been omitted. See Attachment as well as earlier comments on earlier documents.

4. The following discussion indicates that ARCO does not understand the relationship between the different units:

> *In order to make an informed determination regarding appropriate decision units (DUs), sampling units, exposure units, and the appropriate sampling methodology, the DSA will be characterized and mapped in sufficient detail to allow for the definition of the study boundaries including the selection of DUs (Step #4 of the DQO process).*

The scale of the smallest unit as well as the parameter having the greatest coefficientt of variation (CV) within the DU will dictate the sampling design of the characterization sampling effort. Although this CV is not known a priori, the scale of the smallest unit should be specified herein. Please define and compare/contrast all of these different scales.

Similarly:

> *Specifically, the objective is to define the spatial boundaries or geographic area of the investigation, and the scale of decision making or Decision Unit, as illustrated in Figure 5.*

This assumes the DU is coincident with the nature and extent of contamination (N&E). Generally DU=EA<<<N&E. For example DU/EA for earthworm is a point measurement, Mink approximately 20 acres, humans who hunt, fish, and gathers in the basin is the entire basin. Since multiple scales of characterization will be required, sampling to characterize the smallest EA/DU will be necessary. Averages for the larger units can be estimated numerically. The inability to accommodate different scales is a major problem with the MIS/ICS-type sampling scheme described in previous comments.

5. Proposed Addendum 1 mixes a myriad of concepts together that are generally reserved for stand alone documents. Many of whiuch are based on separate DQOs. For example the document appears to demote all work to reconnaissance-level characterization work, yet here they are screening COPCs based on HHRA concerns.

> *COPCs with a concentration greater than primary drinking water standards will also be assessed in a subsequent Phase II evaluation to estimate potential risk to representative human receptors selected for the human health baseline risk assessment. COPC/COPECs with water concentrations*

The same COPCs are associated with BERA-related DQOs. Again see General Comment 1

6. As stated in previous comments on previous documents, since mixed doses from, mixed pathways, originating from multiple media are present at the site, and since the reasonably foreseeable future land use (RFFLU) for the area includes subsistence use by the Tribe, a remedy that results in pre-release baseline will likely be the only alternative that is protective of the Washoe, under CERCLA. Therefore, comparisons of media to published risk-based criteria will result in false negatives and will not result in an alternative that is protective of the Tribe. See also General Comment No. 5.

Specific Comments

1. Page 5; Section 2.1.2. Bullet 1:

> • *location and extent of depositional and non-depositional regions;*

Please describe the importance of doing this work, These areas have likely changed over time, and still change over short duration as flows vary.

2. Page 6; Paragraph 1

> *Grain size distribution will be a key factor in that it is expected that metals concentration will be inversely proportional to grain size.*

The Tribe strongly agrees with this statement since the source term is not distal. It is worthy of note that due to the greater thermodynamic effectiveness of the smaller grain-sizes, these sizes are also more closely associated with the dose that all receptors receive from a given EA. How does ARCO plan to accommodate understanding this dose vs grain-size relationship? Will smaller fractions of the affected and reference areas (e.g. the –62um) be analyzed in the same manner as whole sediment samples? If not, how will dose-response for the various receptors be interpreted? Will site-specific toxicity tests be employed?

3. Page 6; Section 2.1.3 Paragraph 1; Sentence 3:

> *The sum of the scores provides a measure of the overall habitat quality of the study reach. The scoring of aquatic habitat parameters is used to assign aquatic habitat into one of the following habitat designations: optimal, suboptimal, marginal, and poor.*

Why is this being proposed? How will this ancillary, non-decisional, information be employed in the BERA? Where ar the EPA QA/G-4 style DQOs for this work? We only need COCs in time, space, and medium.

4. Page 7; Section 2.1.3 Paragraph 1; Sentence 2:

> *As indicated above, for comparability to data collected historically, sampling locations for surface water, stream sediment, and bioassays will generally be collocated with previously designated stream reaches.*

Do these locations, defined by previous investigators meet the DQO selection criteria (e.g. sediments from depositional areas, or sediments in interstices of gravel in non-depositional area)

5. Page 7; entire Section 2.1.4

Does this task really entail verification/validation of historical SCS/NRCS mapping efforts? Is more work proposed? Where are the DQOs for this work?

6. Page 7; entire Section 2.3.1

Are total and dissolved COCs being analyzed? This type of work needs to be a systematic monitoring program over time or at least should target times in which the affect on EFCR would be anticipated to be the greatest (i.e. greatest mass flux from Bryant w/smallest dilution from EFCR).

Hypothesis tests including level of significance as required by EPA QA/G-4 has still been omitted. See earlier comments on earlier documents as well.

7. Page 10; Section 2.3.1; Paragraph 1; Sentence 1:

> *COPECs with a concentration greater than the Criterion Continuous Concentration (CCC) will be assessed for additional detailed investigations to estimate potential ecological risk to representative ecological receptors selected for the ecological baseline risk assessment.*

Again due to the temporal and spatial variability of the COCs measured in the system, a single snapshot cannot be used to make this evaluation. Long term monitoring as described in Specific Comment No. 6 is necessary. Also, long term monitoring will likely be a requirement of the selected remedy—both during and after construction.

8. Page 10; Section 2.3.1; Paragraph 1; Sentence 2:

> *COPCs with a concentration greater than primary drinking water standards will also be assessed in a subsequent Phase II evaluation to estimate potential risk to representative human receptors selected for the human health baseline risk assessment. COPC/COPECs with water concentrations less than CCC or primary drinking water values will not be evaluated further (Figure 10).*

This approach may suffice for the general public, but it will not be protective of the Washoe. As stated in previous comments, since mixed doses from, mixed pathways, originating from multiple media are present at the site, a remedy that results in pre-release baseline will likely be the only alternative that is protective of the Washoe under CERCLA. Therefore, this proposed approach is incorrect. See also General Comment No. 5.

8. Page 10; entire Section 2.3.2;

As briefly discussed earlier and in several sets of earlier comments on other documents, Washoe recommends measuring sediment chemistry on the -62 um fraction for all sediments. Like surface water, sediments need to be incorporated in a long term monitoring plan—not synoptic surveys. Exceedence (as defined by appropriately developed and agreed upon DQOs) of upstream reference is the criterion for being problematic—not region 9 PRGs or any other proposed threshold (SQRT, SQG, PEC/TEC, etc). In summary ARCO cannot screen-out COPECs based on a single synoptic survey alone.

Like Anniston, the Upper Columbia River, Portland Harbor Superfund sites, does ARCO plan on developing site-specific dose-response curves?

9. Page 10; entire Section 2.3.2;Paragraph 2

> *If the concentrations of COPC/COPECs in sediment at downstream locations are not significantly greater than concentrations measured at the reference location, there is no current measurable effect of COPC/COPECs on sediment quality and no further action to assess EFCR sediment quality is warranted (Figure 10).*

Again, criteria and hypothesis testing needs to be defined prior to sampling. See General Comment No. 3

Attachment: *Review of "**Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18, February 8, 2012"***

Washoe Tribe of Nevada and California

March 13, 2012

Kevin Mayer
Remedial Project Manager
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street, SFD-7-2
San Francisco, CA 94105-3901
Mayer.Kevin@epa.gov

VIA ELECTRONIC MAIL

SUBJECT: *Washoe Tribe's Comments to Draft Off-Property Focused Remedial Investigation Work Plan, Leviathan Mine Site Alpine County, California, Atlantic Richfield Company, February, 2012.*

Dear Mr. Mayer:

The Washoe Tribe of Nevada and California appreciates the opportunity to review and comment on the above referenced document.

The Tribe's comments include both those comments in this letter and the attached comments from AESE, Inc., the Tribe's contractor. The comments attempt to focus on issues relevant to the RI/FS and the selection of the final remedy for the Leviathan Mine Site. To begin, the Tribe's comments are as follows:

1. As part of the Workplan, EPA should require more intensive sampling and specific plans for sampling along Leviathan Mine Road especially in the area where road runoff flows intermittently into the Doud Springs/wetland areas. In addition, EPA should require more intensive sampling in the area of the beaver ponds located on Leviathan Creek below the Site.

2. Figure 3 of the Bryant and Leviathan Creek Watersheds lacks clarity. The watershed for Leviathan Creek does not appear to be correctly depicted especially on the southwestern boundary. Leviathan Mine Road, Doud Springs, and the road by Doud Springs to the East Fork of the Carson River, as well as the East Fork itself

919 Highway 395 South, Gardnerville, Nevada 89410
(775) 265-8600 □ (775) 883-1446 □ (530) 694-2339 □ Fax (775) 265-6240

should be delineated on the map. It appears Station 4L has been omitted from the map.

3. It appears that various site-related chemicals have been eliminated from analysis without appropriate justification (see 9.9 RAGS, 1989). At minimum a section identifying COPC's should be included.

4. The Workplan should identify the Tribe's Cultural Preservation Officer, Darrel Cruz.

5. During any sampling field work, the Workplan should include the requirement that the Tribe be notified and allowed to be present during sampling to observe and verify protocols.

6. Page 10, Section 2.3, Paragraph 2. In reporting the conclusions drawn by Dr. Herbst for the macroinvertebrate sampling over the years, the paraphrasing is unclear and not completely accurate. Directly quoting Dr. Herbst would be more informative and would provide a better base of information.

7. Page 13, Section 2.4.2.2, Last paragraph. Considering the uncertainty as to what extent Mine derived waste was used in the construction of Leviathan Mine Road, the work plan needs to address a more complete sampling plan for the Road. Intermittent drainage from Road runoff occurs during snowmelt, rain on snow, and perhaps summer thunderstorms. It is especially important to analyze as part of the Workplan the runoff from the Road that flows down toward Doud Springs/wetlands.

8. Page 16, Section 2.6.1, Paragraph 1 & 3. A full sampling plan is needed for fugitive dust generation on the roads to the Mine.

9. Page 18, Section 2.6.3.1. The fourth bullet needs to be changed to eliminate the word "seasonal" from the description of current and future off-property Washoe Tribal member access.

10. Page 34, Section 5.2.1, Paragraph 3; last bullet. Rather than sampling low flow in November, sampling should occur in February or March, which are considered true winter low flow conditions.

The remainder of the Tribe's comments are as provided in the attached memorandum from AESE, Inc. If you have any questions or would like to discuss the Tribe's comments further, please feel free to contact me at 775/265-8600, Ext. 1155 or by email at Lynelle.Hartway@washoetribe.us.

Sincerely,

Lynelle Hartway
General Counsel/Resource Policy Program Coordinator
Washoe Tribe of Nevada and California

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-924-0184
http://www.aeseinc.com

MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: March 13, 2012

SUBJECT: Review of "**Off-Property Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18, February 8, 2012**"

CC: Joy Peterson, Hydrogeologist, WTN&C
File

The Washoe Tribe has performed a rapid review of the aforementioned document. Typically, General Comments would be followed by Specific Comments; however, the nature and extent of the General Comments are such that a major rethinking followed by revision will be necessary. Therefore, Specific Comments are not provided herein.

Upon Review of ARCO's February 3, 2012 memo entitled "**Response to Comments Reference Area Focused Remedial Investigation Work Plan Leviathan Mine Site, Alpine County, California Administrative Order for Remedial Investigation and Feasibility Study (the UAO) CERCLA Docket No. 2008-18**", it became apparent that EPA did not provide ARCO with the Washoe's full set of technical comments. This is concerning because the important message in these comments is that reconstruction of Pre-Release Baseline (PRB), for sediments/riparian soils from upstream of the mined-area to areas downstream of the confluence of the Carson River, must be the conducted prior to doing any-work associated with reference areas. This is because the reconstruction of PRB for these abiotic media is the basis for future reference area selection.

The lack of this understanding, is apparent by actions proposed in both the Reference Area FRI Workplan as well as the Off-Property FRI Workplan. If unaccommodated in

the workplans, this lack of understanding, will either result in major set-backs or will result in proposed remedies that are not protective of the Washoe and others.

The two sets of comments that were not transmitted by EPA to ARCO, but require incorporation into the aforementioned workplans are[1]:

1. The November 19, 2011 memo entitled: ***"November 18, 2011 conference call with EPA, LEVNRTC, and EPA's contractors regarding pre-release baseline/background"*** (Attachment A)

2. The November 5, 2011 memo entitled: "**Rapid review of "Draft: REFERENCE AREA FOCUSED REMEDIAL INVESTIGATION WORK PLAN, Leviathan Mine Site, Alpine County, California",** Atlantic Richfield Co, September 2011 (Attachment B).

Again, the "headwaters" of all risks attributable to the mine as well as services to receptors all originate with sediments/soils/solid-phase. Therefore, the concern for this site has always been with reconstruction of PRB of riparian soils/sediments—this must be done first to identify prospective reference areas for biotic and perhaps surface water resources.

Beyond the concerns identified in the attachments and the discussion above, we have also only recently realized that ARCO may be proposing an MIS/ICS-type sampling scheme for reference areas as well as potentially affected areas. The Tribe has concerns with applying such schemes for situations in which advection-dispersion processes have likely resulted in surficial chemical gradients that would likely be apparent within a single decisional unit (DU; i.e. DUs that are not homogeneous nor homogeneously heterogeneous and contain apparent surficial trends). More discussion on these concerns follow in the General and Specific Comments

[1] Concerns identified in these two documents prevail. Therefore, we strongly recommend that these two documents be reviewed prior to proceeding to the General Comments section below. The third attachment (Attachment C) should be reviewed while reviewing General Comment No. 8.

General Comments

1. The NCP is a regulation that focuses on the cleanup of releases of hazardous substances; therefore, any determination of risk to human or ecological receptors pertains to the incremental risk attributable to the release(s) alone—not risk caused by prerelease conditions such as risk from natural materials or by other exogenous factors.[2,3] Below are excerpts from pertinent portions of the NCP used in discussion with EPA Regions 1 and 10. Portions of the excerpts have been emphasized to expedite the argument.

> **§ 300.1 Purpose and objectives.**
>
> The purpose of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is to provide the organizational structure and procedures for preparing for and responding to **discharges of oil and releases** of hazardous substances, pollutants, and contaminants.
>
> .
> .
>
> **§ 300.5 Definitions.**
>
> *Pollutant or contaminant* as defined by section 101(33) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which **after release into the environment** and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring. The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under section 101(14) (A) through (F) of CERCLA, nor does it include natural gas, liquified natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas). For purposes of the NCP, the term pollutant or contaminant means any pollutant or contaminant that may present an imminent and substantial danger to public health or welfare of the United States.
>
> ***Release*** as defined by section 101(22) of CERCLA, **means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed**

[2] The term "risk" is not found in the definitions section of the NCP (40CFR300.5).
[3] The Spokane Tribe of Indian's (STI) Hazardous Substances Control Act explicitly defines risk as "risk attributable to the release" because the STI realized that in many instances EPA has incorrectly estimated total risk (risk attributable to the release in addition to risk that was already present prior to the release) when the NCP requires estimation of incremental risk alone.

> **receptacles containing any hazardous substance or pollutant or contaminant),** but excludes: Any release which results in exposure to persons solely within a workplace, with respect to a claim which such persons may assert against the employer of such persons; emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine; release of source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under section 170 of such Act, or, for the purposes of section 104 of CERCLA or any other response action, any release of source, byproduct, or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. 7901 et seq.); and the normal application of fertilizer. For purposes of the NCP, release also means threat of release.

To reiterate, the NCP is a regulation that focuses on the cleanup of releases of hazardous substances; therefore, any determination of risk to human or ecological receptors pertains to the incremental risk attributable to the release(s) alone—not risk caused by prerelease conditions such as risk from natural materials or by other exogenous factors.

Further, as stated in Attachment A,

> *Since EPA's analyses of human health risk and ecological risk are based on absolute risk, and not incremental risk attributable to the release[4], it is quite likely that cleanup values determined via both the BERA and the HHRA will not be able to be attained.[5] This is because natural mineralization in the area likely already exceeds these absolute-risk based thresholds for a handful of COCs. Since these absolute-risk based thresholds cannot be attained via cleanup, natural background/pre-release conditions will likely be the default cleanup level.[6,7,8]*

The approach outlined in the above inset, has technical and legal precedent—It is the approach applied in the ROD and subsequent CD for the Midnite Uranium Mine Superfund site located on the Spokane Indian Reservation. Although not

[4] Our understanding of CERCLA is that EPA is to address "excess risk" attributable from a release or releases from the site; however, in practice EPA relies on absolute risk in risk management decision making.

[5] In such instances, EPA will be employ institutional controls, such as signage, to protect human health

[6] Under CERCLA the PRP cannot be required clean-up to conditions that are more protective than natural conditions.

[7] This reality was realized when AESE was first hired by the Tribe in the late 1990s, and has been expressed to EPA back in that time frame on numerous occasions. The requisite cleanup levels governed by the Washoe Traditional uses of the area only serve to reinforce this assertion.

[8] At this point, the BERA and HHRA are merely pro forma and are not required for any meaningful decision making regarding cleanup.

readily apparent to EPA, PRB is intrinsically protective of Washoe's uses, since they have used this area for thousands of years. Anything less will likely result in a cleanup that is not protective of the Washoe. In other words, a cleanup designed for the generals public—a group that does not live there.

2. As discussed above, since PRB will likely be the ultimate cleanup-goal, even the slightest exceedence of PRB of any of the TAL metals will result in an incremental risk to the Tribe, that could exceed EPA's risk threshold. This means that none of the TAL listed COCs should be removed until it can be screened against PRB for each of the three Zones identified in Figure 1 (Also see Attachment B)

3. From the discussion above, in order to estimate the risk attributable to the release, EPA must first know the nature and extent of contamination prior to developing estimates of risk, otherwise, the estimates of risk are a mixture of risk attributable to the release and risk attributable to natural or pre-release conditions.

   The approach, described in the Workplans, is problematic since strategies for determining the nature and extent of contamination, differ markedly from those that would be employed to evaluate total risk.

   We also want to caution, that areally-averaged values used to provide a "provisional value for background" are not typically employed in the geologic profession where materials are likely heterogeneous (as described in the SCS reports for the various counties, and geologic maps of surficial materials for the area).

   In general, a geologist samples at multiple depths for the following reasons:

   1. point-values of reference materials for pre-release baseline are located beneath each contaminated sample.

   2. EPA must know the depth that COCs have penetrated in order to ensure that core sub-sampling does not result in obtaining a mixture of contaminated materials and background materials. This situation is common when a depth of sampling is specified arbitrarily (e.g. 0-6 inch deep is common for HHRA) and will result in dilution of the contaminated population likely resulting in false negative results (Type II error). This means that shallow coring is required. Such cores will retrieve both contaminated and pre-release samples within a single core.

   The Tribe has heard concerns from EPA's team regarding the presence of PRB sediments. Specifically, "we think that its could be hard to find PRB soils or sediments at locations downstream of the mine, because it is a down-cutting system". The Tribe strongly disagrees with this loose assumption and submits that relict PRB

sediments are likely found in key areas within the floodplain as well as in in-stream depositional areas (See Attachment B as well). [9]

4. The Order Requirements Section identifies the following objectives; however, the FRI work plans do not describe approaches to meet all of these objectives. Specifically, none of the proposed work focuses on reconstruction of pre-release baseline, which is a required to delineate the nature and extent of contamination.

> "The SOW identifies the objectives of the project and presents a framework of activities for the RI/FS as appropriate. General SOW requirements include: "plan and conduct those investigations necessary to characterize the Leviathan Mine Site and actual or potential contaminant migration pathways (Environmental Setting and Pathway Characterization); define the source (Source Characterization); **define the nature and extent of contamination (Contaminant Characterization);** identify actual or potential receptors (Receptor Identification); and conduct an assessment of risks posed to actual or potential receptors (Risk Assessment)." The SOW requires **that "all planning will be based on DQOs.**" [Emphasis added]

The inset statement is consistent with the approach described by the NCP; however, all subsequent actions described in the Work Plans focus on sampling to evaluate total risk, rather than the extent of contamination. In other words, it appears that EPA is looking at sampling to estimate total risk as the first screen or decision point, and if total risk is exceeded, *then* they will compare sample values to some arbitrary provisional value of background[10,11,12,13].

---

[9] If this statement is indeed true, the Tribe would be encouraged, because it means that the nature and extent is much smaller than anticipated. However, we will not know until a form informed sampling is employed,

[10] The approach makes little sense, since some of the natural uncontaminated soils likely exceed EcoSSL / R9PRGs.

[11] The term "background" as used by EPA in this document as well as many of its guidance documents is not equivalent to pre-release conditions, as required by the NCP. Therefore, "background" as described in the Workplan cannot be used to evaluate the risk attributable to the release.

[12] This provisional value of background if determined from site data will be an unknown weighted mixture of soils whose parent materials are unspecified and this mixture also will contain contaminated and natural soils. The resulting background cutoff (e.g. UCL95 for the COI population—not the mean) will be driven by the samples containing the highest COI, which is likely a contaminated sample or a sample that contains high natural levels of the COI, but only represents a very small area or volume of material.

[13] As described in General Comment No. 1, an estimate of pre-release conditions is necessary to estimate risk to the receptor that **is attributable to the release**. Since risk is receptor-specific, the exposure area or DU of a given receptor is defined by his anticipated home-range. This means that "background", although provisional must be determined on the same scale as the home range of the receptor of interest—its not some single value that is spatially independent, and sampling and estimation of prerelease conditions is not a simple endeavor as portrayed in the Work Plans.

The Tribe offers a time-tested approach involving short cores for such a reconstruction that is commonly relied upon by practicing professional geologists or hydrogeologists, in its comments that have been attached.

5. As stated above, the Tribe has numerous concerns with MIS/ICS schemes for situations in which surficial trends would likely be present within a single DU. This concern extends to the following time periods as well:

   - pre-release baseline (PRB),
   - the active mining period;
   - post mining, but pre-mitigation, and
   - post-mitigation to current conditions

   Please provide citations for which surficial MIS/ICS approaches have been employed to reconstruct these four situations. Please also provide a map and shapefiles depicting the proposed DUs, keeping in mind that the DUs are specific to the home-ranges of the targeted receptors (including humans).

   The Tribe also points-out that MIS/ICS approaches are likely not compatible the California Guidance (DTSCA, 1997). Therefore results likely would not meet ARARs.

6. The following statement suggests that ARCO believes that the ore-body was not a blind deposit (See Attachment No 2; General comment No 3 and Figure 1)

   the geology, mineralization, and alteration associated with Leviathan Mine are localized and do not extend to Bryant Creek;

   This definition means that there is a pre-mining fingerprint which would result in a surficial geochemical trend negating the applicability of MIS/ICS sampling. In such instances, surficial characterization using discrete samples with evaluation of scale or volume of geostatistical support is suggested.

   Figure 1 below, has been revised since the November 19, 2011 memo (Attachment A) to include locations along the longitudinal axis of a hypothetical dispersion curve that would likely be represent values obtained via Multi-Increment sampling (MIS) with compositing or Incremental Composite Sampling (ICS). In summary UCL95 (or another upper-end of a given distribution metric) representing the physical location of the cut-offs between Z1/Z2 and Z2/Z3 is necessary—means of means (of means) are useless for this characterization

7. Advection-dispersion modeling has been successfully used to model current or predict future spatial distributions of contaminants for nearly 100 years. However, as mentioned in the attachments, a rule of thumb is that 90% of the annual solids that are transported from a source occurs during 1-2 days of the year. This means that conceptually speaking, annual dispersion dominated transport events in the form of layers or varves are represented in the geologic record at depositional areas.

   The problem with the proposed technique of sampling only surficial deposits is that the resultant contamination is in layers and the surficial sampler does not know what layer he/she is sampling. Due to differential erosion and differential deposition, this approach leads to comparing concentrations of COCs derived from a variety of layers (mixed populations). This is why geochronological reconstruction is necessary. High-frequency sub-sampling of samples obtained via shallow cores and analysis of Cesium-137 (^{137}Cs) and TAL COCs is typically used to investigate these concerns, enabling geochronological reconstruction (Church and Kirschner, 2008; Church et al 2007)

8. In light of the numerous major concerns described above, the DQOs will need major revision to focus on PRB as the criteria that defines nature and extent of contamination as well as PRGs. The Washoe had provided comments on DQOs drafted for the PMP:

   November 6, 2008 memo entitled:

   > Review of ***"Draft Data Quality Objectives Report: Remedial Investigation and Feasibility Study, Leviathan Mine Alpine County, California, AMEC Geomatrix, Inc., October 2008"***

   However the drafting of the comments concluded as describe below:

   > *The drafting of this review ceased on November 5, 2008 at section 8.2, after discussion with EPA where they verbally assured us that DQOs, as defined by EPA guidance, would be deferred to the SAP/FSP portions of the project, diminishing the need for this document.*

Although the DQOs in this FRI document are qualified in terms of being "programmatic DQOs", and have tentatively been accepted by EPA (EPA 2010). The study-specific DQOs, like those described by EPA 2006, still need to be drafted and agreed upon by technical representatives of the participating governments. The Tribe resubmits AESE's DQO Worksheet and Decisional Flowchart (DFC) that has proven useful in the past at other sites.

References Cited

DTSCA, 1997, Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments a Hazardous Waste Sites and Permitted Facilities – Final Policy, Department of Toxic Substances Control.

Church, S.E., and Kirschner, F.E., 2008, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, Abstracts with Programs, Geological Society of America, v. 40, no. 6, p. 272.

Church, S.E., and Kirschner, F.E., LaDonna M. Choate, Paul J. Lamothe, James R. Budahn, and Zoe Ann Brown, 2007, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, USGS SIR 2007-5262.

U.S. Environmental Protection Agency (U.S. EPA), 2010a, Approval with Comments and Direction to Implement 2009 Draft Program Work Plan and Addendum for Remedial Investigation and Feasibility Study at Leviathan Mine Site, Alpine County California, November, 2009. May 13.

U.S. Environmental Protection Agency (U.S. EPA), 2006, Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 EPA/240/B-06/001

Figures

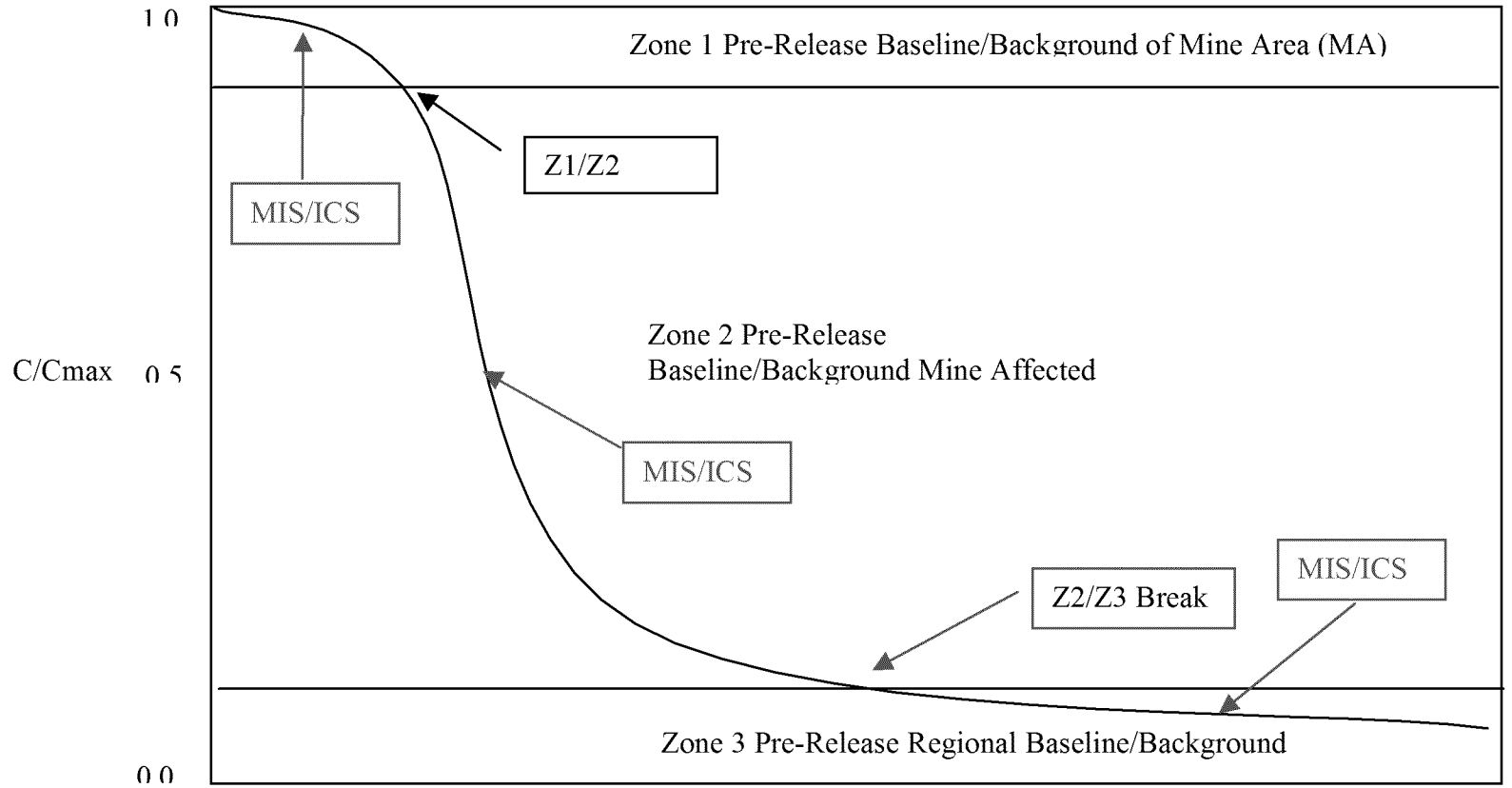


Figure 1. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a given **exposed ore-body**. Source zone (Zone 1), dispersion dominated or transition zone (Zone 2), and nearly unaffected regional background/baseline (Zone 3). After Church et al. (2007). This figure has been revised since the November 19, 2011 memo (Attachment A) to include locations alone the hypothetical dispersion curve that would likely be representative of Multi-Increment sampling (MIS) with compositing or Incremental Composite Sampling (ICS).

Attachment A: November 19, 2011 memo entitled: ***"November 18, 2011 conference call with EPA, LEVNRTC, and EPA's contractors regarding pre-release baseline/background"***

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-924-0184
http://www.aeseinc.com

MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: November 19, 2011

SUBJECT: November 18, 2011 conference call with EPA, LEVNRTC, and EPA's contractors regarding pre-release baseline/background

CC: Joy Peterson, Hydrogeologist, WTN&C
File

The conference call was be somewhat productive, but it was apparent that EPA and its contractors have not given pre-release baseline/background the requisite attention. EPA tentatively agreed during the call that since EPA's analyses of human health risk and ecological risk are based on absolute risk, and not incremental risk attributable to the release[1], it is quite likely that cleanup values determined via both the BERA and the HHRA will not be able to be attained.[2] This is because natural mineralization in the area likely already exceeds these absolute-risk based thresholds for a handful of COCs. Since these absolute-risk based thresholds cannot be attained via cleanup, natural background/pre-release conditions will likely be the default cleanup level.[3,4,5]

[1] Our understanding of CERCLA is that EPA is to address "excess risk" attributable from a release or releases from the site; however, in practice EPA relies on absolute risk in risk management decision making.
[2] In such instances, EPA will be employ institutional controls, such as signage, to protect human health
[3] Under CERCLA the PRP cannot be required clean-up to conditions that are more protective than natural conditions.
[4] This reality was realized when AESE was first hired by the Tribe in the late 1990s, and has been expressed to EPA back in that time frame on numerous occasions. The requisite cleanup levels governed by the Washoe Traditional uses of the area only serve to reinforce this assertion.
[5] At this point, the BERA and HHRA are merely pro forma and are not required for any meaningful decision making regarding cleanup. Reference areas also are not necessary since PRB which has determined onsite *is* the restoration goal.

The discussion above highlights the importance of accurately determining pre-release baseline (PRB). Under these conditions, this work is more important to setting cleanup levels than the BERA or the HHRA. Further, if PRB is underestimated, large tracts of naturally mineralized areas would falsely be included as requiring cleanup. Alternatively, if PRB is overestimated, large areas that are actually affected by releases would not be included for cleanup. In past communications associated with the HHRA, the Tribe has recommended to EPA that two exposure areas or zones be defined:[6]

1. The mined area (MA; Zone 1 on Figure 1) and
2. The mining affected area (MAA; Zone 2 on Figure 1)

In order to define these zones and minimize the aforementioned errors, the break points between Zones 1-2 (MA/MAA) and Zones 2-3 (MAA/Regional Background) must be determined ***for PRB for the site***[7]—not determined via an arbitrary reconstruction by sampling adjacent areas deemed as "reference areas" based predominantly on location.

During the meeting it became clear that EPA and its contractors did not understand that AMEC is proposing to attempt to determine an arbitrary single value of "background" by sampling adjacent areas. EPA's and its contractor initially believed that AMEC would be sampling areas representing "eastern Sierra slope areas" to define the cutoff for Regional Background (break points between Zones 2-3); however, they finally realized that AMEC was also attempting to "fill Zone 2 bins" with some of their proposed locations (e.g. cinnabar ridge, presumably a naturally mineralized area). This issue may have been resolved via language stating that AMEC is only to be sampling to reconstruct regional background, but the Tribe needs to follow-through on this issue and needs to be convinced that EPA understands the importance of this work to determining cleanup goals.

References Cited

Church, S.E., and Kirschner, F.E., 2008, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, Abstracts with Programs, Geological Society of America, v. 40, no. 6, p. 272.

Church, S.E., and Kirschner, F.E., LaDonna M. Choate, Paul J. Lamothe, James R. Budahn, and Zoe Ann Brown, 2007, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, USGS SIR 2007-5262.

[6] This zonal approach is applied by EPA in the ROD for the Midnite Uranium Mine Superfund Site, Washington.

[7] Breakpoint for Zone2/3 could be UTL95 of samples obtained regionally for Zone 3; Breakpoint for Zone 1/2 must be determined onsite using core as described by Church and Kirschner (2008) and Church et al (2007)

Figures

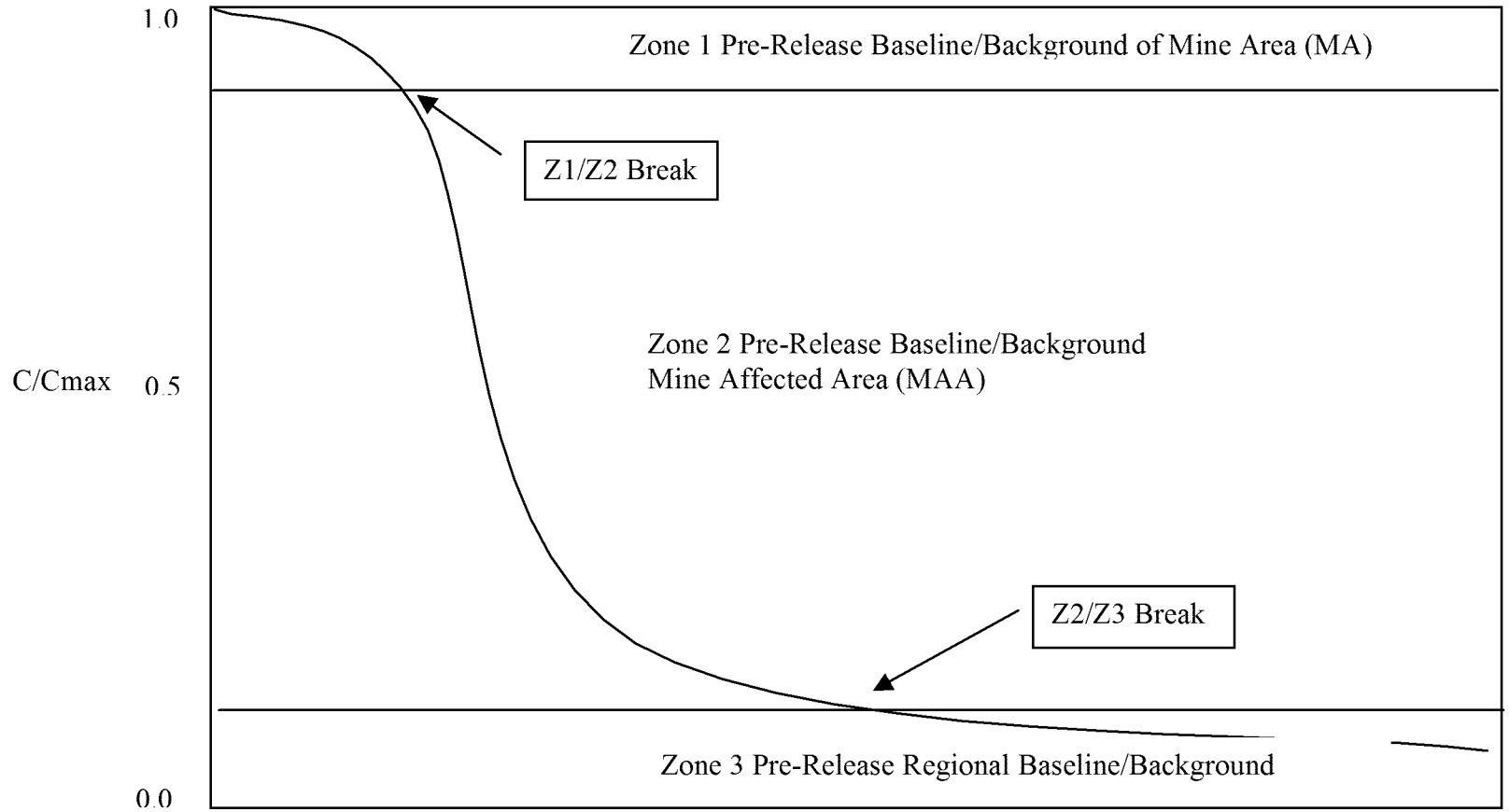


Figure 1. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a given **exposed ore-body**. Source zone (Zone 1), dispersion dominated or transition zone (Zone 2), and nearly unaffected regional background/baseline (Zone 3). After Church et al. (2007).

Attachment B: November 5, 2011 memo entitled: "**Rapid review of "Draft: REFERENCE AREA FOCUSED REMEDIAL INVESTIGATION WORK PLAN, Leviathan Mine Site, Alpine County, California",** Atlantic Richfield Co, September 2011

AESE, Inc.

P.O. Box 50392,
Henderson, NV 89016
509-924-0184
http://www.aeseinc.com

MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: November 5, 2011

SUBJECT: Rapid review of ***"Draft: REFERENCE AREA FOCUSED REMEDIAL INVESTIGATION WORK PLAN, Leviathan Mine Site, Alpine County, California", Atlantic Richfield Co, September 2011***

CC: Joy Peterson, Hydrogeologist, WTN&C
File

The Washoe Tribe has performed a rapid review of the aforementioned document. General Comments are followed by Specific comments.

General Comments

1. In the context of CERCLA, reference areas serve as experimental controls used to compare attributes of site affected media to non-site affected media.[1] Prospective candidate reference areas, cannot be proposed until this reference population has been characterized and understood.

   On Page 8 section 3.3 Task 1, the Work Plan cites EPA Guidance:

   > ***An ideal reference area would have the same physical, chemical, geological, and biological characteristics as the site being investigated (U.S. EPA, 2002).***

   The problem is that the definition is the "same ***as but for the release***".

   Since all biologic and human services provided by a given affected area originate with the abiotic media[2] (i.e. surface water, ground water, sediment, soils, and air), pre-release baseline (PRB) of the abiotic media must first be determined to ascertain the qualities of these media prior to mining. Once abiotic media-specific PRB has been determined, prospective candidate reference areas likely to have similar biotic characteristics as PRB (i.e. flora and fauna, but for the release) can be identified and characterized and winnowed-down to a few reference areas for PRB. Finally, comparisons between abiotic and biotic media sampled at both the potentially impacted area (PIA) and the PRB reference areas can be made to ascertain the affects of mining.

   This approach differs markedly from that proposed in the work plan, where reference areas are proposed based on general conditions that do not include chemical characterization of the abiotic materials as an important attribute.

2. A mine/orebody is defined as a volume of rock or material that contains target minerals that can be extracted, milled, and marketed to yield a profit—A mine is not defined by the highest concentration of the target mineral. This means that other prospective reference areas likely have equally high concentrations of COIs as the PIA or even the mine area; however, the volume of material was too small to be economically feasible to extract at the time mining occurred. Based on the general

[1] Much like in a laboratory setting where attributes of treated individuals are compared to control (untreated individuals) to discern a caused measurable change in attribute or condition.

[2] Abiotic media are the foundation or basic building blocks of any environment. EPA has long-realized this relationship and assesses risk by modeling up-chain transfer from the abiotic media. EPA also manages or remediates the abiotic media.

geology depicted in the provided map[3], it is highly likely that contaminants of interest (COIs) measured at points in the candidate reference areas could exceed concentrations of COIs measured at points in the PIA prior to releases from mining. If this occurs, the proposed design and proposed statistical approach will result in falsely biasing-high the geochemistry or other measured attributes of the prospective reference area(s).

3. Since PRB of sediments along Leviathan and Bryant creeks is unknown because the potentially impacted area (PIA) of the site area has covered or buried PRB sediments and the physical system has been altered via mining, PRB chemistry of sediments will need to be reconstructed prior to proposing reference areas for further analysis. Geochemical reconstruction should be conducted in a manner depicted in Church and Kirschner (2008) and Church et al. (2007) using environmental tracers and high-resolution sub sampling of cores from depositional areas, including riparian soils, where over bank spills have occurred during flooding events.[4]

   Once, this work has been accomplished and the premining status of the orebody has been determined (i.e. was the deposit fully exposed or fully buried ("blind") prior to mining; Figures 1-3), reconstruction of pre-mining baseline of ground water, surface water, and soils can be initiated . Selection of candidate reference areas for characterization and subsequent evaluation of effects on biotic media associated with the three zones depicted in Figure 4 cannot occur until these reconstructive steps have been finalized.

4. The off-property work plan (zones 2 and 3 of Figure 4) and subsequent work also should not be completed prior to performing the reconstruction abiotic PRB reconstruction described above.

   This work must be completed prior to selection of reference areas since we need to first know the nature and extent of contamination (as interpreted via cores of sediments and riparian soils) to allow us to develop a target range of COIs in reference areas for zones 1-3 (Figure 4). Again there is a need to demonstrate that candidate reference areas fall within the anticipated range of concentrations of abiotic media. This work will likely require back and forth analysis of both areas, but it would be very helpful to have the results of the cores first.

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[3] Analysis of soil maps for this region would likely indicate the aforementioned distribution is even more highly variable than depicted by the geology maps

[4] Correctly located cores contain sediments/soils representative of both pre and post release geochemical conditions at a given locations. Characterization of PRB of geochemical conditions is then used to prospect for appropriate reference areas that support biota representing populations that would likely be present, but for the release.

5. The DQOs portion (Section 4) needs to be redrafted in light of concerns described above as well as in the Specific Comments, below. Notwithstanding the aforementioned concerns, decisions goals and decision statements contain two or more compound questions that are unrelated or mutually exclusive.

   Step 4 or Boundary definition. The Target population, for example, is sediments that represent PRB in each of the 3 (or 2) reaches. The DQOs still really miss the mark and do not specify data quality required to perform the statistical comparison tests (or even the tests). Again all testing and acceptance/decisional criteria must be specified apriori, preferably in this document.

6. According to the SAP (Section B1.1),

   > *The RI/FS Program Work Plan outlined the overall tiered approach for completing the RI/FS for the Leviathan Mine Site. This approach proposed that additional details (e.g., rationale, methods, locations, and frequency) would be provided within the FRI work plans and the Focused Feasibility Study work plans. This approach was approved by the U.S. EPA in response to Atlantic Richfield's December 15, 2008, proposal for producing the RI/FS Work Plan in stages (U.S. EPA, 2009).*

The SAP was briefly reviewed. In light of the previous concerns as well as those described in the Specific Comments section below, since the SAP is inextricably linked to the FRI WP, the SAP will also require a substantial revision. The Tribe believes a thorough review of the SAP as well as the other Appendices is not warranted at this time.

Specific Comments

1. Page 7; Section 3.0; Sentence

> *To support the selection of reference streams, the initial Reference Area activities were conducted as described in a September 15, 2010, letter to the U.S. EPA (Atlantic Richfield, 2010c) and approved by the U.S. EPA by email on October 19, 2010 (U.S. EPA, 2010d).*
>
> .
> .
> .
> *Finally, reference stream reaches were selected for each site stream reach.*

Please describe the logic supporting this work prior to developing to data quality objectives to identify candidate reference areas. Also see General Comment No. 1.

2. Page 8; Section 3.1; Last Paragraph 1:

> *The Programmatic DQOs recognized that locating an undisturbed ore deposit similar to Leviathan Mine that can be used as a reference area is unlikely. Therefore, finding the perfect reference stream is also unlikely, and the evaluation of potential reference streams needs to include a thorough evaluation of the key characteristics of the site stream reaches as compared to the potential*

Please cite and provide evidence directed at the status of the pre-mining orebody. Has it been formally established that that deposit was not essentially blind?

This statement highlights the need for the work identified in General Comment No. 1 to be conducted (as well, as work in the down stream areas) prior to any work associated with identifying candidate reference areas.

3. Page 8; Section 3.1; Paragraph 1:

> An ideal reference area would have the same physical, chemical, geological, and biological characteristics as the site being investigated (U.S. EPA, 2002). In order to characterize the physical, chemical, geological, or biological variability of the site, key site characteristics were identified:
>
> - Sediment storage or transport, and number of tributaries;
> - Chemical variability – hardness, dissolved organic carbon, pH, temperature, major cations (calcium, magnesium, sodium, and potassium), major anions (sulfate and chloride), and alkalinity;
> - Geological variability – mapped rock type and mineralization; and
> - Biological variability – terrestrial habitat type. Physical variability – elevation and stream characteristics of flow rate, gradient,

See General Comment No. 1. The true definition of reference is same as "but for the release". Many if not all of these "the key characteristics" described above likely have changed or have been influenced as a result of historic and present releases or physical actions that have occurred during mining (e.g. landslide, aspen creek reroute, etc., some changes are described in the Draft BERA problem formulation document)

4. Page 11; Entire Section 3.6.1:

The geologic section of this report, which is likely the most important section from a similitude standpoint, is very weak. Again, the pre-mining conceptual geology needs to be reconstructed prior to any further work. See General Comment No. 1.

5. Page 13; Entire Section 3.6.3:

Like the geology section, the geomorphology section also is very weak and in some instance not necessarily correct. Like the geology section, most of this discussion are directed at post.
Mining likely has supplied significant amounts of sediment/debris to the point that downstream geomorphology has been affected. Again this discussion has little bearing on the identification of candidate of reference streams.

6. Page 36; Section 3.2; Paragraph 1: Sentence 2

The alternative outcomes are:

1. Concentrations of site COPCs are higher than concentrations of Reference Area COPCs. Site COPCs may present an unacceptable risk to human or ecological receptors and complete exposure pathways need to be evaluated through further study.

This statement contains two separate, unrelated questions that have different DQOs

7. Page 36; Section 3.1; Paragraph 2: Sentence 1

Decision statements are:

.

.

2. Do site concentrations of COPCs exceed reference values for potentially complete exposure pathways?

Same as previous comment.

1. Are PIA COPCs statistically different than Reference areas COPCs? if yes then:

2. Is Unacceptable risk involved? if yes then:

3. Disposition of PIA via NCP 9 criteria

8. Page 39; Section 4.4; Paragraph 1: Sentence 1

The Target population, for example, is sediments that represent PRB in each of the 3 (or 2) reaches. The DQOs still really miss the mark and do not specify data quality required to perform the statistical comparison tests (or even the tests). Again all testing and acceptance/decisional criteria must be specified a priori, preferably in this document.

9. Page 39; Section 4.4; Paragraph 1: Sentence 2:

> *Decision units will be defined for soil, floodplain soil, and sediment sample collection where the MIS protocol is used.*

The acronym "MIS" is not defined in the document.

10. Page 39; Section 4.6; Paragraph 1: Sentence 1:

> *For tasks that involve collecting analytical data, decision rules as statistical hypothesis tests (e.g., on-property COPC concentrations are greater than reference COPC concentrations) are set and a criterion is set for acceptable limits on estimating uncertainty.*

This is regurgitation of guidance and work should appear in this document at this location. Regardless, this information needs to be determined and agreed upon by all parties prior to initiating any work.

11. Page 55; Section 6.0; Paragraph 1: Sentence 2:

> *A minimum of five site and five reference-area samples will be required to conduct the analysis outlined below.*

Please provide the all of underlying calculations and all of the assumptions used to determine these minima. This type of discussion should be reserved for the DQO section of this report.

12. Page 55; Section 6.0; Paragraph 1: Item 1:

> *1. Upper bound concentrations (the lower of the maximum concentration or the 95th upper confidence level) reported for a relevant reference-area data set will be compared to the maximum concentration reported for a specific decision unit. If the maximum (or upper-bound) concentration for reference-area value is greater than the maximum value for the decision unit data, the chemical will be eliminated as a COPC for a specific decision unit. If not, proceed to Step 2.*

Decision units are reaches by media. For example sediments likely only require reference areas for Zone 1 and 3 as discussed earlier. If mountaineer and others tributaries are believed to historically contribute minimal flow and metals to Leviathan Creek, and R1=Rn, then a single reference area could be used for surface water. Again,

the selection of reference areas portion of the project requires much more thought and work.

13. Page 55; Section 6.0; Paragraph 1: Item 2:

> *Data from the decision unit and reference-area data sets will be compared using cumulative probability (Q-Q) plots generated using the U.S. EPA's ProUCL software, Version 4.00.05 (U.S. EPA, 2009e). The Q-Q plots compare two probability distributions by plotting their quantiles against each other....*

This is not consistent with EPA guidance and this method does not provide a quantitative comparison of populations. Generally hypothesis test such as "H_o PIA population = reference population" (= .05 = .90 are employed). Other approaches involving cutoffs determined for the reference areas are employed (e.g. UTL95, UCL95, or maximum value sampled from the reference population).

Specific Comments (Figures)

Figure 3. The watershed for Leviathan creek is not correctly depicted. Recommend drawing drainage basins for each stream using different annotation/color. Also appears that a leg of Mountaineer is missing.

Figure 5. Station 4L has been omitted

Figure 7. Reader would benefit by addition of bedrock geology and topography.

References Cited

Church, S.E., and Kirschner, F.E., 2008, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, Abstracts with Programs, Geological Society of America, v. 40, no. 6, p. 272.

Church, S.E., and Kirschner, F.E., LaDonna M. Choate, Paul J. Lamothe, James R. Budahn, and Zoe Ann Brown, 2007, Determination of Premining Geochemical Background and Delineation of Extent of Sediment Contamination in Blue Creek Downstream from Midnite Mine, Stevens County, Washington, USGS SIR 2007-5262.

Figures

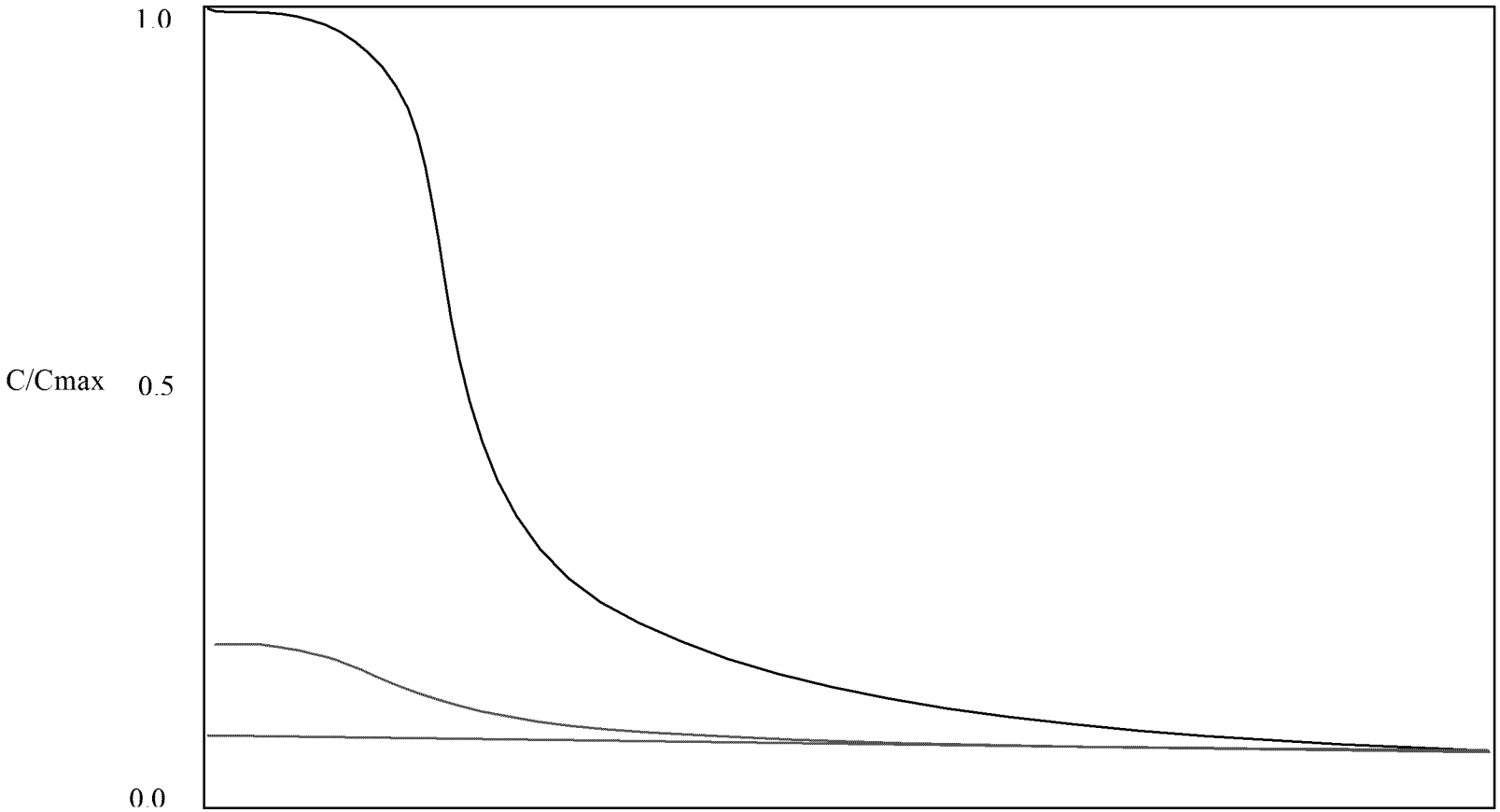

Figure 1. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a mine for three situations: Ore body fully exposed at the surface (black), "blind" deposit (red), and deposit that is partially exposed at the surface or the groundwater to surface water pathway daylights near the ore-body. Cmax = maximum concentration of the given COC observed in the three areas **prior too mining**.

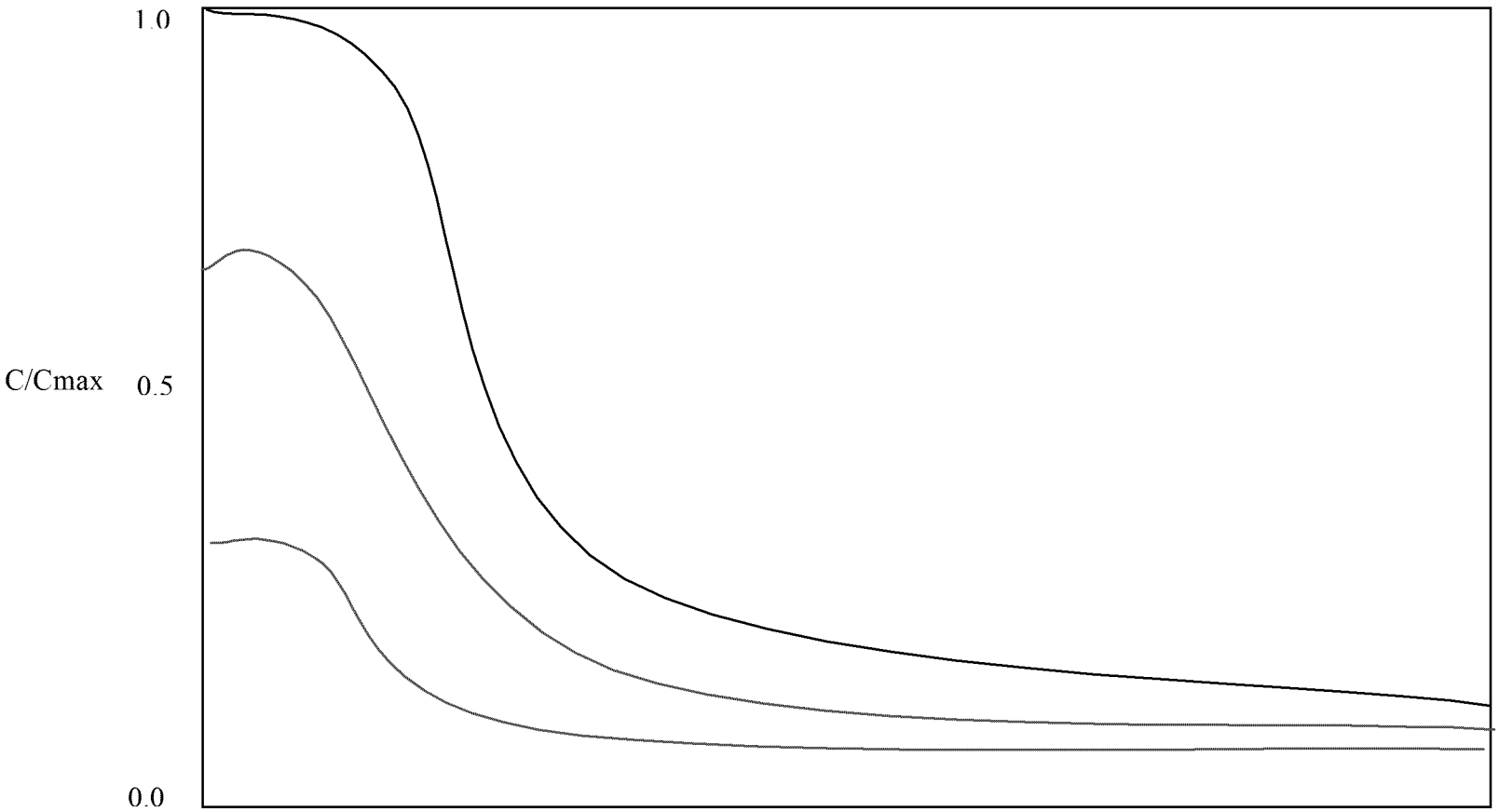

Figure 2. Hypothetical **pre-mining baseline** (blue), **post mining baseline** (red) and **during mining baseline** (black) concentrations of a given COC measured in sediment at various distances from a given mine where the ***orebody was exposed prior to mining***. Cmax = maximum concentration of the given COC observed in the area over all times.

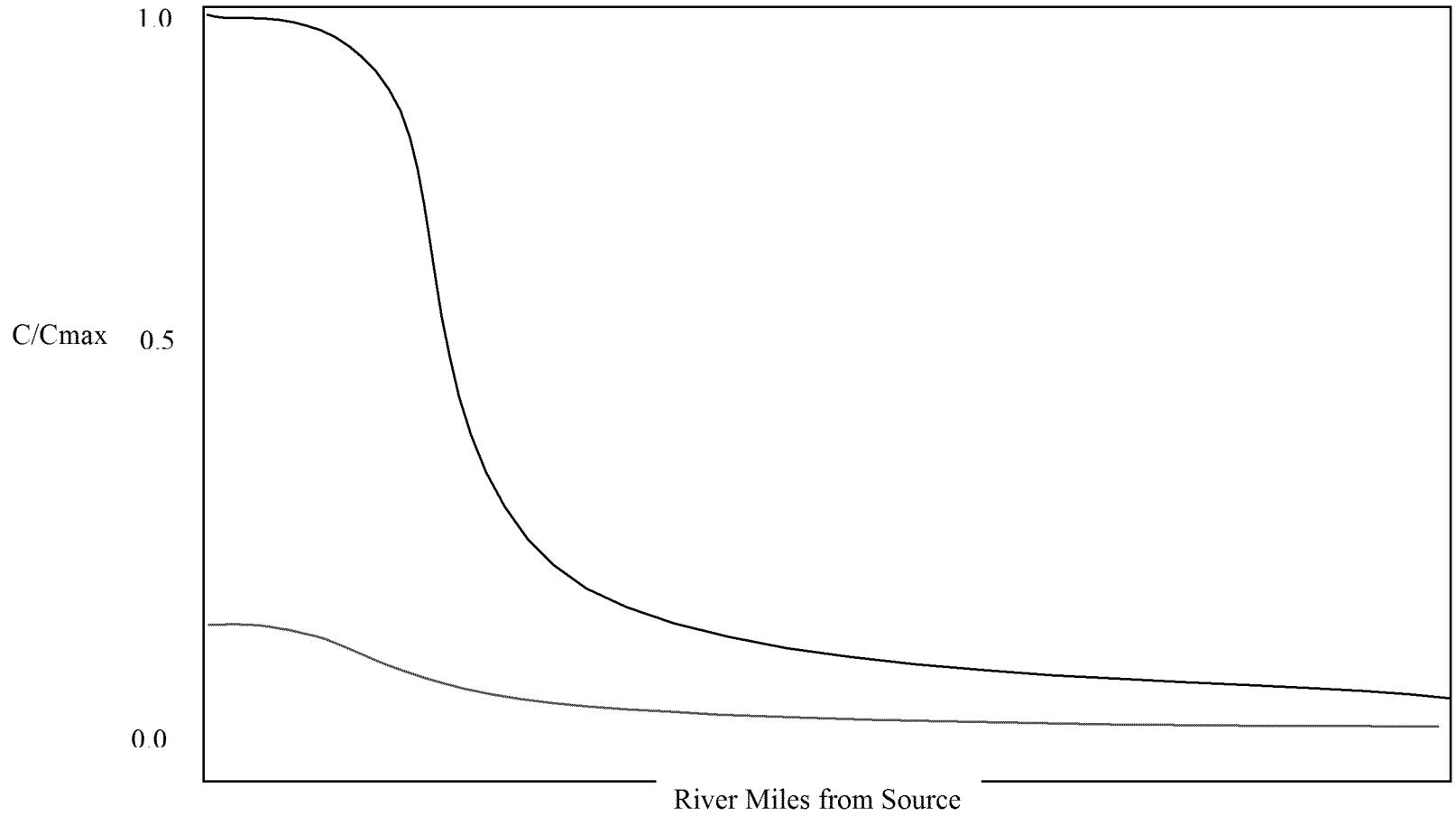

Figure 3. Hypothetical **pre-mining** (blue) and **post mining** (black) baseline concentrations of a given COC measured in sediment at various distances from a given mine ***where the orebody was exposed prior to mining***. Area between the curves defines the longitudinal nature and extent of contamination caused by the release(s). Cmax = maximum concentration of the given COC observed in the area over all times.

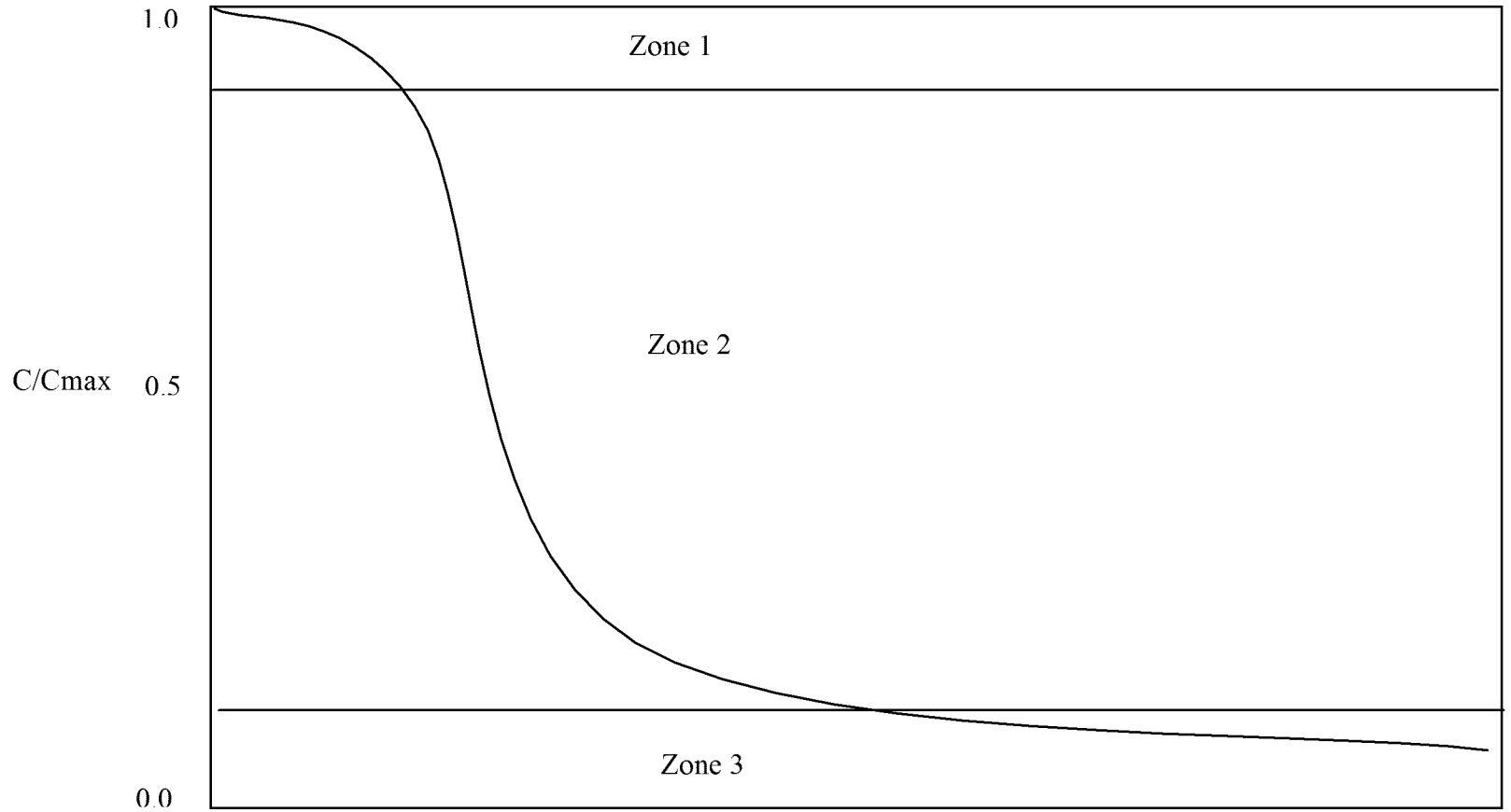

Figure 4. Hypothetical **pre-mining baseline** concentrations of a given COC measured in sediment at various distances from a given **exposed ore-body**. Source zone (Zone 1), dispersion dominated or transition zone (Zone 2), and nearly unaffected regional background/baseline (Zone 3). After Church et al. (2007).

Attachment C: AESE DQO Worksheet and Decisional Flowchart (DFC)

Appendix A: DQO Worksheet

Table of Contents

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1.0 Introduction to Data Quality Objectives (DQO) Process

EPA (2000) provides guidance on development of Data Quality Objectives (DQO) for a single study. However, the document does not adequately describe how DQOs for each study are developed using the Preliminary Conceptual Site Models (PCMs). An example is given below in which DQOs for a single study (identified as a box or arrow on the PCSM) is developed in the absence of all existing data. Ultimately these DQO's are compared to existing data to determine if the existing data meet the required DQOs. Shortfalls in the existing data are data gaps in which further study/field work may be necessary.

This Attachment describes the Process for Data Gaps Analysis from a top-down perspective. This attachment contains four sections: Section 1.0 is a brief introduction to the DQO and Data Gap Analyses Processes. Section 2.0 describes how the Data Gaps are identified for and entire project which is comprised of numerous studies that are described by the Conceptual site Model. Section 3.0 describes the data quality objectives (DQO) process, Section 4.0 presents the DQOs for a single medium study (e.g. soil sampling), and Section 5.0 presents the references used to develop this attachment.

2.0 DQOs and the Procedure for Data Gap Analysis

Following the scientific process, every study, being historic or future, being large or small has DQOs driving the study design.

1. PCSM used as visual accounting tool to determine what studies would be necessary in the absence of all historic data (Sometimes called data needs). An example PCSM is depicted in Figure 1. Each box and arrow on the PCSM identifies a medium or flux that requires initial investigation.

2. DQO's are then derived for each and all of these studies. The result of this work are published in a stand alone DQO document. It is worthy to note that several disciplines including, but not limited to Physical scientists responsible for characterizing media for contaminant transport and fate and determining the nature and extent of contamination; human health risk assessors, and ecological risk assessors all likely have different data needs and therefore different DQOs for each medium.

3. Historic studies (and their DQO's, if known) are compared to the freshly derived DQO's in Step 2 to develop necessary studies (sometimes referred to study-gaps) and identify

datagaps. The list of deficiencies are termed Studygaps or datagaps.

5. The DQOs are then used to design the new studies that fill the studygaps and datagaps identified by the different disciplines

6. Studies are conducted

7. The performance of studies are determined by comparing the results to DQOs

3.0 Study-Specific Data Quality Objectives Process

An example for development of a single DQO, for a single study, by the human health risk assessment team, for a single medium (soils in this case) is given below. The example employs a decisional flow-chart to frame the DQO question or problem at hand (Figure 2).

The U.S. Environmental Protection Agency (EPA) DQO process was used to identify the specific needs for the project and to establish decision rules for the collection of soil sampling data. The DQO process is a seven-step iterative planning approach used to prepare plans for environmental data collection activities and is intended to help site managers plan to collect data of the right type, quality, and quantity to support defensible site decisions. The seven steps are as follows:

1.. State the Problem - Summarize the contamination problem that will require environmental data, and identify the resources available to resolve the problem; develop the conceptual site model (See Figures 1 and 2)

2.. Identify the Decision -. Identify the decision that requires environmental data to address the contamination problem (Figure 2).

3.. Identify Inputs to the Decision - Identify the information needed to support the decision and specify which inputs require new environmental measurements (Figure 2).

4.. Define the Study Boundaries - Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision (Figure 2)

5.. Develop a Decision Rule - Develop a logical "if.. . then.. ." statement that defines the conditions that would cause the decision-maker to choose among alterative actions (Figure 2).

6.. Specify Limits on Decision Errors — Specify the decision-maker's acceptable limits

on decision errors, which are used to establish performance goals for limiting uncertainty in the data (Figure 2)

7.. Optimize the Design for Obtaining Data - Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQO (This step is not portrayed herein)

4.0 Medium Sampling Plan Data Quality Objectives

This section details the DQOs as they relate to a sampling plan for a given medium at a given site. The section uses the format presented in Data *Quality Objectives Process for Hazardous Waste Site Investigations* (EPA, 2000).

Step 1. State the Problem

1. Identify members of the planning team
2. Identify the primary decision-maker
3. Develop a concise description of the problem
4. Specify available resources and relevant deadlines for the study

Step 2. Identify the Decision

1. Identify the principal study questions.
2. Define alternative actions that could result from resolution of the principal study questions.
3. Combine the principal study questions and the alternative actions into a decision statement
4. Organize multiple decisions

Step 3. Identify Inputs to the Decision

1. Identify information that will be required to resolve the decision statement
2. Determine the sources for each item of information required
3. Identify the information that is needed to establish the action level

4. Confirm the appropriate measurement methods exist to provide the necessary data

Step 4. Define the Boundaries for the Study —

1. Specify the characteristics that define the population of interest
2. Define the spatial boundary of the decision statement
3. Define the temporal boundary of the decision statement
4. Define the scale of decision-making
5. Identify practical constraints on data collection

Step 5. Develop a Decision Rule

1.. Specify the statistical parameter that characterizes the population of interest.
2. Specify the action level for the study
3. Develop a decision rule (an "if. . . .then...." statement)

Step 6. Specify Tolerable Limits on Decision Errors

1. Determine the range of the parameters of interest
2. Identify the decision errors and choose a null hypothesis
3. Specify a range of possible values of the parameter of interest where the consequences of decision error are relatively minor
4. Assign probability values to points above or below the action level that reflect the tolerable probability for the occurrence of decision errors.

Step 7. Optimize the Design — Soil Sampling Program

1. Review the DQO outputs and existing data
2. Develop general data collection design alternatives
3. Formulate the mathematical expressions necessary for each design alternative

4. For each data collection design alternative, select the optimal size that satisfies the DQOs

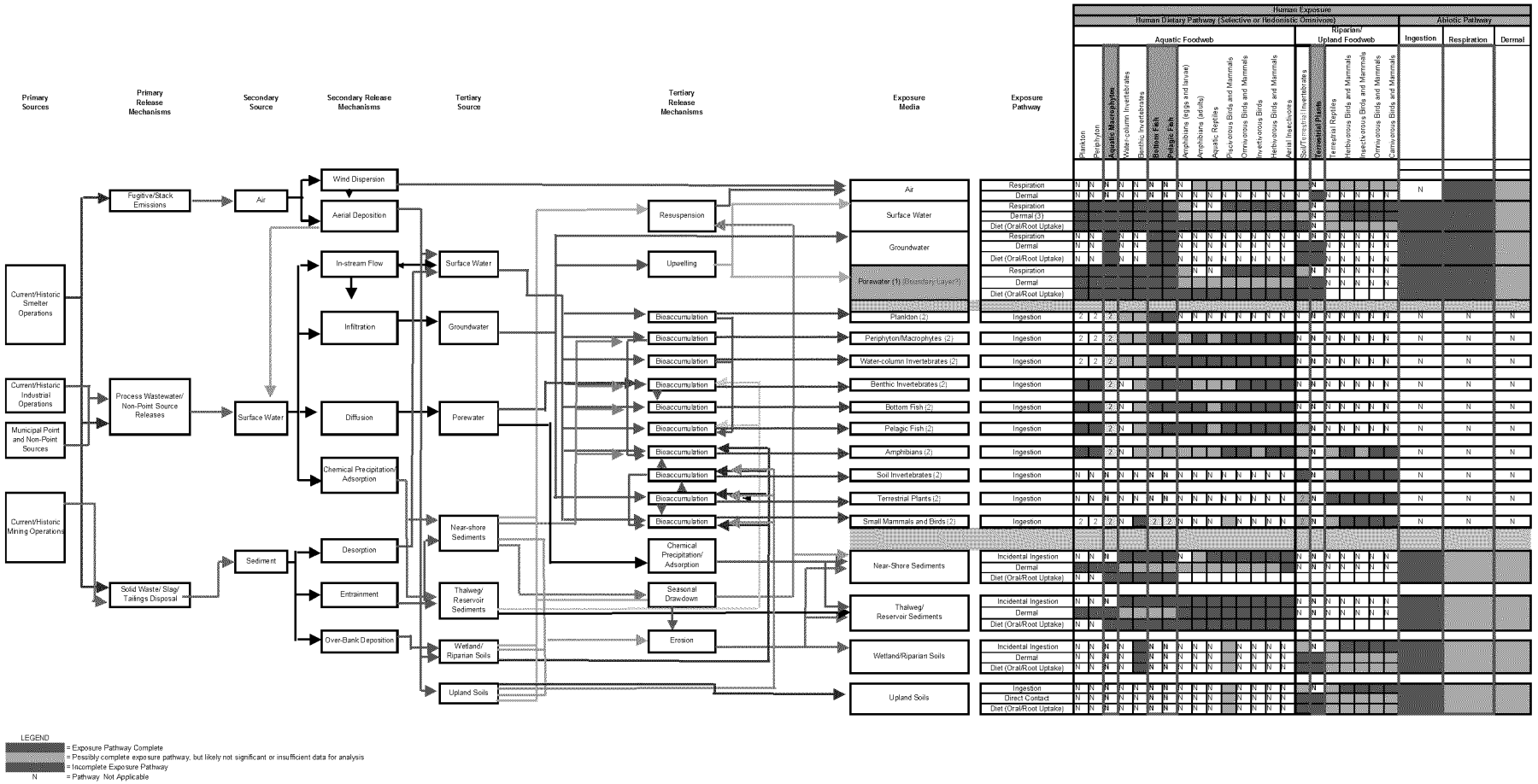
5. Select the most resource-effective data collection design that satisfies the DQOs

6. Document the operational details and theoretical assumptions of the selected design in the sampling and analysis plan

5.0 References Cited

U.S. EPA, 2000, Data Quality Objectives Process for Hazardous Waste Site Investigations EPA QA/G-4HW Final, EPA/600/R-00/007 January 2000.

Figure 1. Example Preliminary Conceptual Site Model for a Generic Lacustrine/Riverine Site in the Western U.S. The basic interaction between ecological and human receptors (Native Americans or others who rely heavily on site resources) are also depicted.



LEGEND

= Exposure Pathway Complete
= Possibly complete exposure pathway, but likely not significant or insufficient data for analysis
= Incomplete Exposure Pathway
N = Pathway Not Applicable

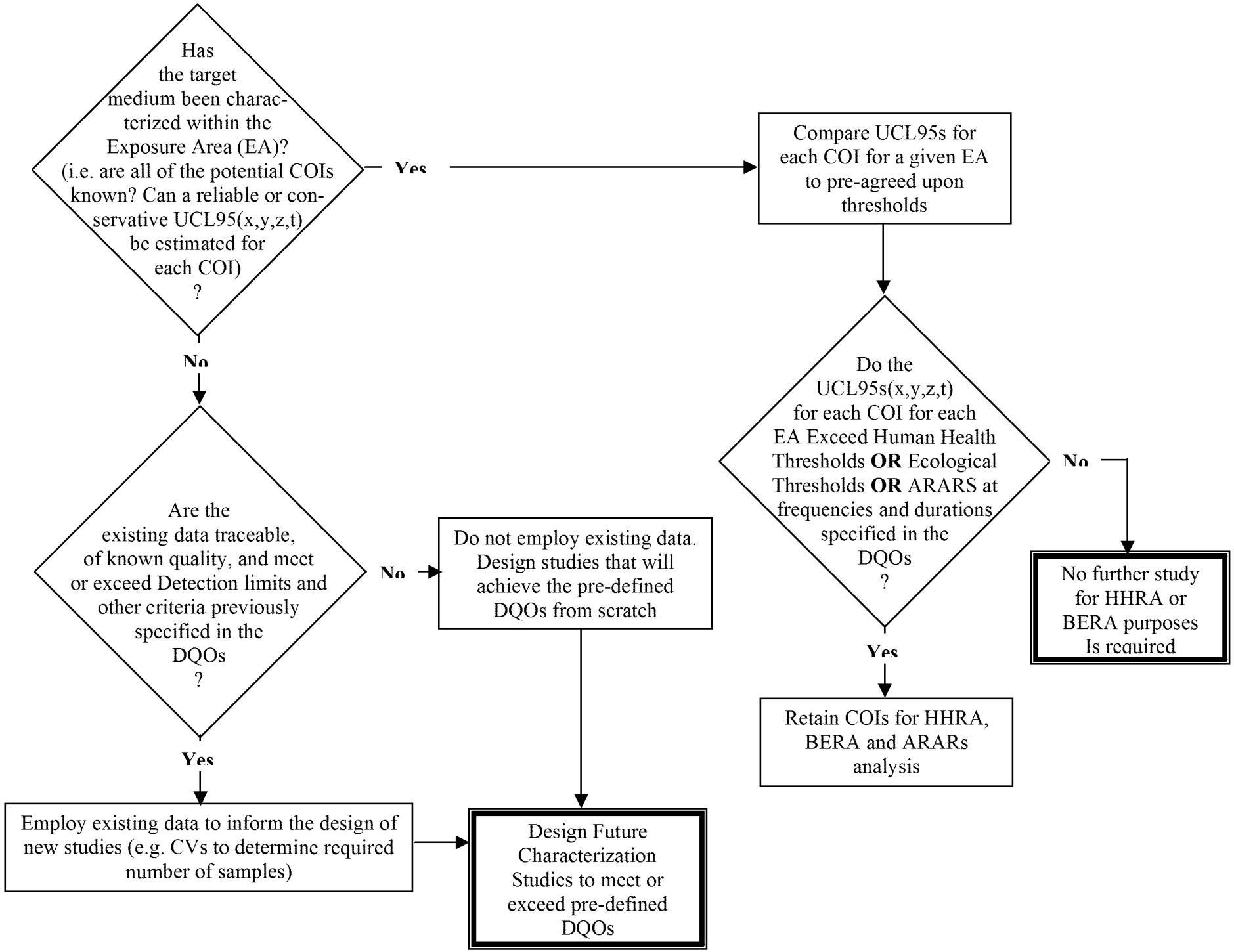
Red outlined columns are dominant HH media/pathways

1. By definition, porewater IS groundwater. (No need to add more confusion of terms... Clean Porewater Act?)
2. Upon death, Receptor contributes, as solid-phase and liquid-phase detritus to the dietary, dermal, and incidental ingestion pathways ...dietary is probably of importance
3. Chemisorption onto external organic material
4. Inhalation of COCs contained in media via Sweatlodge pathway

Pathways required for HHRA as well as FS remedial design (ultimate remedial design will hinge on ability to discriminate between the source of Dose to fish i.e. sediment or surface water)

Fish
- Ingestion (Diet)
- Dermal
- Sediment Resident Organisms
- Ingestion
- Dermal

Figure 2. Example Decisional Flow Chart (DFC) for characterization of a given medium (represented as a single "Box" in a wire-frame style preliminary conceptual site model (PCSM). The DFC, along with predefined DQOs, the PCSM, and Existing Studies/data (that have been evaluated to determine if they meet the predefined DQOs) are the basis for Data Gaps or Study gaps Analyses. In other words, The DFC, along with predefined DQOs, the PCSM defines what is needed (in the absence of any data): Existing Data are what we have. Datagaps are the shortfalls in the ability of Existing Data to meet the DQOs (or data needs).


Has the target medium been characterized within the Exposure Area (EA)? (i.e. are all of the potential COIs known? Can a reliable or conservative UCL95(x,y,z,t) be estimated for each COI) ?
Yes
Compare UCL95s for each COI for a given EA to pre-agreed upon thresholds
No
Are the existing data traceable, of known quality, and meet or exceed Detection limits and other criteria previously specified in the DQOs ?
No
Do not employ existing data. Design studies that will achieve the pre-defined DQOs from scratch
Yes
Employ existing data to inform the design of new studies (e.g. CVs to determine required number of samples)
Design Future Characterization Studies to meet or exceed pre-defined DQOs
Do the UCL95s(x,y,z,t) for each COI for each EA Exceed Human Health Thresholds OR Ecological Thresholds OR ARARS at frequencies and durations specified in the DQOs ?
No
No further study for HHRA or BERA purposes Is required
Yes
Retain COIs for HHRA, BERA and ARARs analysis

Attachment 4: Rapid Review of *Surface Water Technical Data Summary Report and Response to U.S. EPA and LRWQCB Comments on the Report titled Evaluation of Historical and RI/FS Surface Water Data Leviathan Mine Site Alpine County, California (FK_160314 SW Report compiled_wo_App 6A_6B.pdft.doc)*